AUTOMOTIVE INDUSTRIES

PASSENGER CARS • TRUCKS • BUSES • AIRCRAFT • TRACTORS • ENGINES • BODIES • TRAILERS • ROAD MACHINERY • FARM MACHINERY
PARTS AND COMPONENTS • ACCESSORIES • PRODUCTION EQUIPMENT • SERVICE EQUIPMENT • MAINTENANCE EQUIPMENT
ENGINEERING • PRODUCTION • MANAGEMENT

MARCH 1, 1951

In This Issue . . .

M-41 and M-51 Army Trucks

Chrysler V-8 Machining Techniques

Hotchkiss All Light-Alloy Car

Helicopter Powered by Twin Ram Jet

Designing Automatic Transmission Gears

Complete Table of Contents, Page 3

A CHILTON PUBLICATION

What's YOUR problem?

● Troubled with fingerprint corrosion? Are parts rusting between machining and assembly? Do you get customer complaints because of rusted shipments? These and a score of other troublesome problems can be eliminated with the use of the right STANORUST Rust Preventive.

To help you get the maximum benefit from the STANORUSTs, Standard Oil has a corps of lubricating specialists located throughout the Midwest. One of these men is near your plant. You can get his services quickly and easily. His wide experience and special training in rust prevention will help you make real savings. Why not arrange today for his visit by calling the nearest Standard Oil (Indiana) office?

8 grades of STANORUST

STANORUST No. 3-FP
is a fingerprint remover. It can be used to eliminate the cause of fingerprint corrosion and to deposit a protective film in one simple dipping operation.

STANORUST No. 4-V
has a Stoddard-solvent base which evaporates to leave a thin film for temporary rust prevention.

STANORUST No. 12
provides economical protection under average indoor conditions. It can be applied cold.

STANORUST No. 95
is designed for protection of parts in moderately severe indoor storage. It also can be applied cold.

STANORUST S-1
is a semi-fluid product, designed to give protection over a longer period than the No. 95 grade. It is suitable for outdoor service, if parts are under cover.

STANORUST 1-XC
is a non-fluid product which is recommended for protection of parts under severe outdoor conditions. It has been thinned with a volatile solvent and can be applied cold with a swab or brush.

STANORUST 3-X
is a soft, grease-like product and offers protection against severe indoor storage and moderately severe outdoor conditions.

STANORUST 6-X
is a heavy, petrolatum-type product that protects against the most severe outdoor exposure. It meets a government specification which includes a requirement that it protect against corrosion for a period of not less than 10 years without renewal.

For maximum protection against rust . . .

● STANORUST Rust Preventives offer maximum protection against rust because they contain a moisture-displacement additive which makes them far superior to straight mineral oils or to petrolatums frequently used for rust prevention.

The STANORUSTs have been thoroughly tested and proved effective on a wide variety of rust prevention jobs, ranging from elimination of fingerprint corrosion to protection of equipment under severe outdoor storage conditions.

The complete STANORUST line is briefly described at the right. The booklet offered will bring you complete details. You can secure a copy by calling the local Standard Oil (Indiana) office or by writing 910 South Michigan Avenue, Chicago 80, Illinois.

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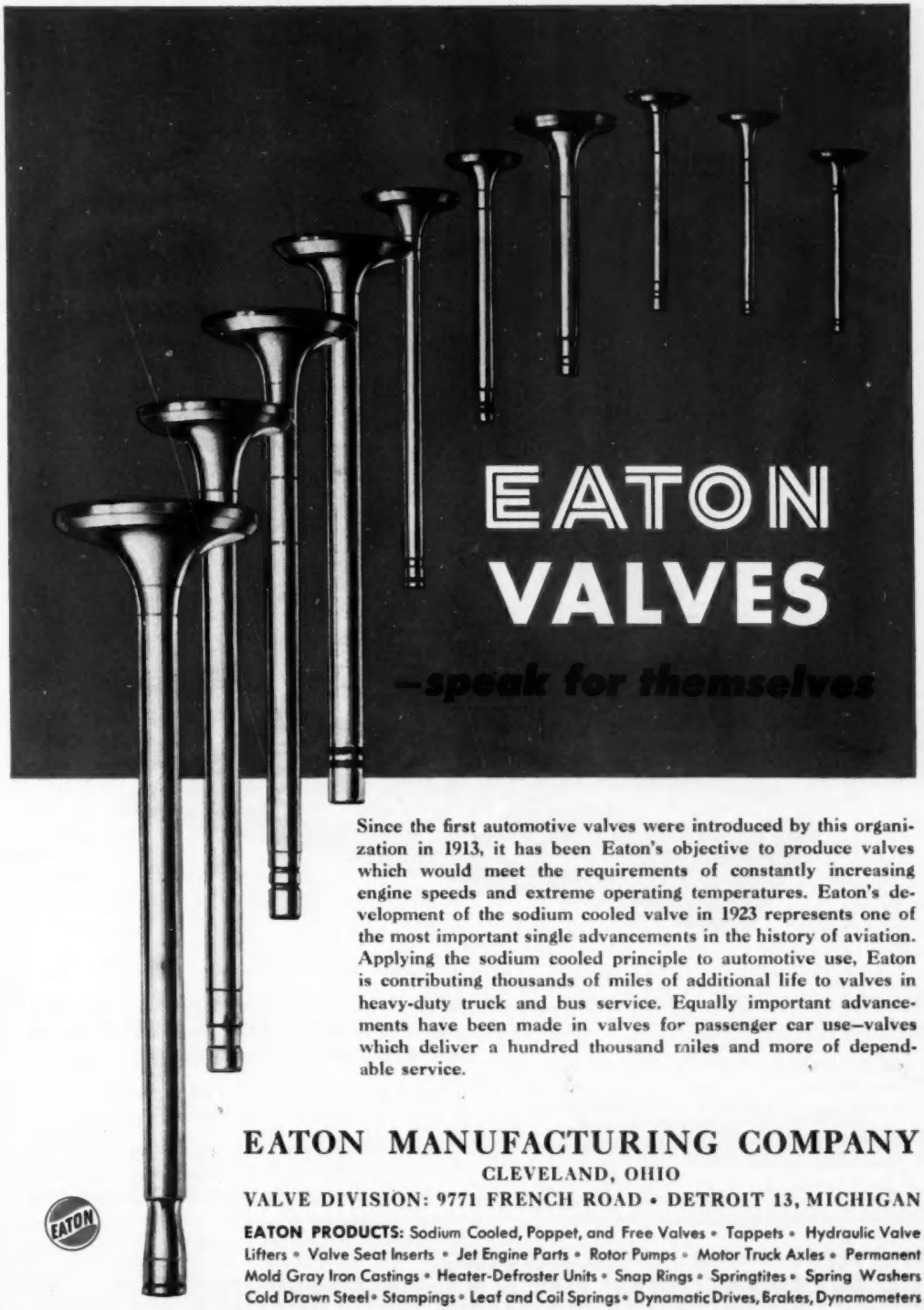
RUST PREVENTIVES

SEND FOR THIS BOOKLET

STANDARD OIL COMPANY (INDIANA)



Since the first automotive valves were introduced by this organization in 1913, it has been Eaton's objective to produce valves which would meet the requirements of constantly increasing engine speeds and extreme operating temperatures. Eaton's development of the sodium cooled valve in 1923 represents one of the most important single advancements in the history of aviation. Applying the sodium cooled principle to automotive use, Eaton is contributing thousands of miles of additional life to valves in heavy-duty truck and bus service. Equally important advancements have been made in valves for passenger car use—valves which deliver a hundred thousand miles and more of dependable service.

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VALVE DIVISION: 9771 FRENCH ROAD • DETROIT 13, MICHIGAN

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Triple-alloy steels containing nickel offer designers the following *triple* advantages:

1. OUTSTANDING PERFORMANCE—Strength and toughness, resistance to wear, fatigue or shock to meet a wide range of requirements, as dictated by design.
2. RELIABILITY—based on consistently uniform response to heat treatment.
3. ECONOMY—resulting from standard compositions precisely graded to match the engineers' needs.

Service records established by triple-alloy steels over a period of years show that they are giving excellent results in many diverse and exacting applications.

The many standard combinations available permit accurate and economic selection for specific uses.

Because of their many advantages, these triple-alloy steels warrant your careful consideration when planning new or improved designs. We shall be glad to furnish counsel and data upon request.

THE INTERNATIONAL NICKEL COMPANY, INC. 67 Wall Street New York 5, N.Y.

AUTOMOTIVE INDUSTRIES

Published Semi-Monthly

March 1, 1951 Vol. 104, No. 5

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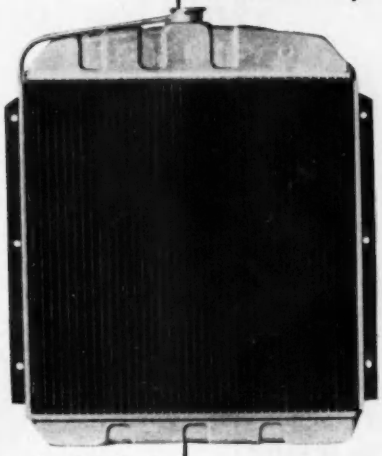

Young Stamped Tank Sheet Metal Radiator for Kaiser-Frazer's new economy car, the "Henry J." Simple in design, efficient in operation, low in cost.

(Right) Kaiser-Frazer's New "Henry J"

Modern automotive engineering tends toward compact, efficient cooling—the utmost in heat transfer per pound of radiator weight. That's why Young is especially proud to reveal its contributions to the efficient, economical operation of America's smaller passenger cars. Young engineering soundness has been proved, too, on some of the Nation's largest over-the-road and earth-moving equipment. Let Young engineer your next heat transfer requirement; details gladly furnished upon request.

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only 3 grinders do the work of 40!

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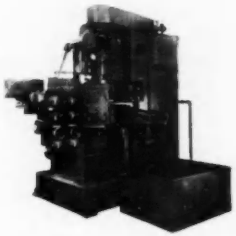
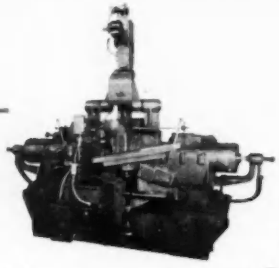


No. 926-30" Besly Double Vertical Spindle Grinder

No. 226-30" Besly Double Spindle Wet Grinder

and 1 Like This—



Now Produce As Much as 40 Old-Style Machines—and Do It Better!

These three new Besly Grinders provide a superior product and more output per man-hour for one of the country's leading piston ring manufacturers. Specific savings include:

1. *A reduced capital investment*—with first cost cut by the sale of the old-style grinders.
2. Operation savings which quickly paid the actual cost.
3. Major economies in power and abrasive and maintenance costs—and;
4. A substantial reduction in job change-over time.

Formerly, it took 40 machines to meet production requirements; today, 3 Besly Grinders do the work . . . and, actually exceed accuracy specifications for finish, parallelism and flatness. Scrap is reduced and the need for 100% inspection eliminated.

If your product requires precision-finished surfaces in quantity, Besly may be able to show you the way to greater production at lower cost. A Besly engineer will gladly consult with you without obligation.

JOB PRODUCTION FACTS

No. 226-30" Besly Grinder grinds up to 490 passes per minute on 2¾" diam. x 3/32" rings (kayspun material or cast iron). Removes .010" rings in three passes—holding size from ring to ring within plus or minus .0001 and parallelism within .0001. Then, on the Besly No. 926-30" Piston Ring Finisher, two or three passes, according to requirements, are taken—holding the same close tolerances . . . and grinding 250 passes per minute. Three machines outproduce forty because more stock is removed per pass—at a rate of four times as many passes per minute. Time required for changes from one job to another is reduced sharply for many operations.

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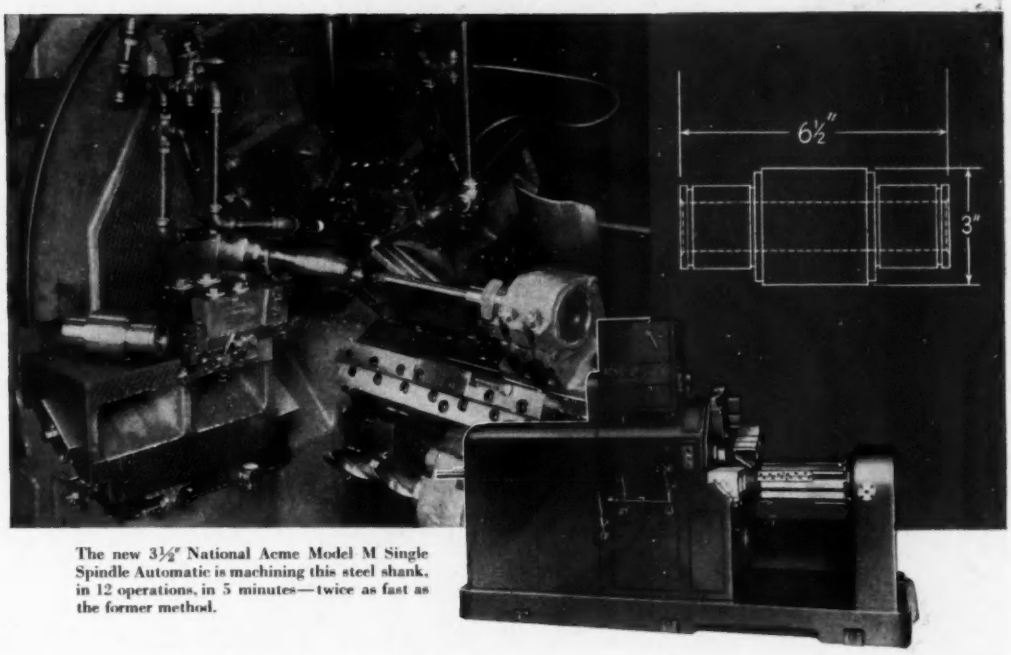
GRINDER DIVISION • BELOIT, WISCONSIN



The new 3½" National Acme Model M Single Spindle Automatic is machining this steel shank, in 12 operations, in 5 minutes—twice as fast as the former method.

Steel Shanks Machined Twice as Fast

—AND TO .001 CONCENTRICITY

The new Acme-Gridley Model M Single Spindle Automatic has the strength to maintain close tolerances, such as the .002 total indicator reading for concentricity between the outside diameters and reamed hole of the steel shank illustrated. The rugged open frame provides plenty of room for chip clearance and for easy tool adjustment, too.

Frame strength adequate for high speed or carbide tools helps the Model M chalk up production records like this one. But that's only part of the Model M's time-saving story. Eight independently operated tool slides and three ranges of automatic spindle speeds permit the use of speeds and feeds best suited to each cut. Several short end operations can be performed while heavy forming cuts are being made from the side slides.

For increased production, increased *profit*, get the new Model M—tops for ease of operation, speed, stamina and economy. It's built in three capacities from 3½" to 5½". Ask for production estimates on your jobs.

● Complete information on the new Acme-Gridley Model M Single Spindle Automatic is contained in Bulletin M-50. Ask for your copy.

Machine obsolescence is the creeping paralysis that strangles profits.

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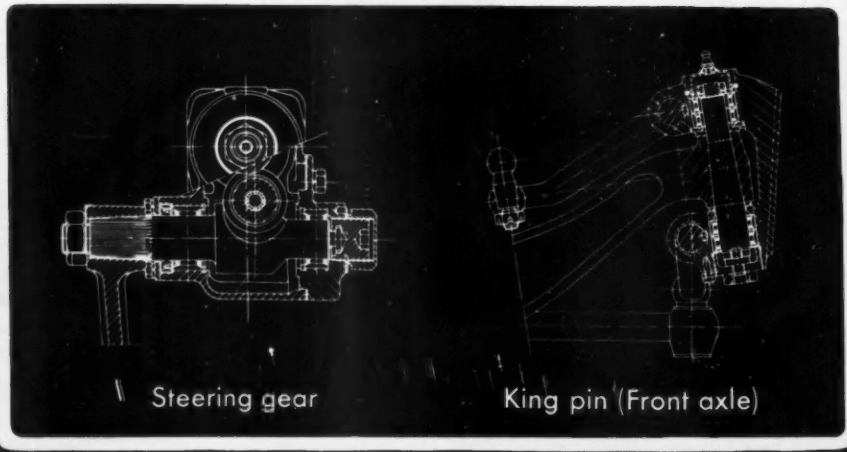
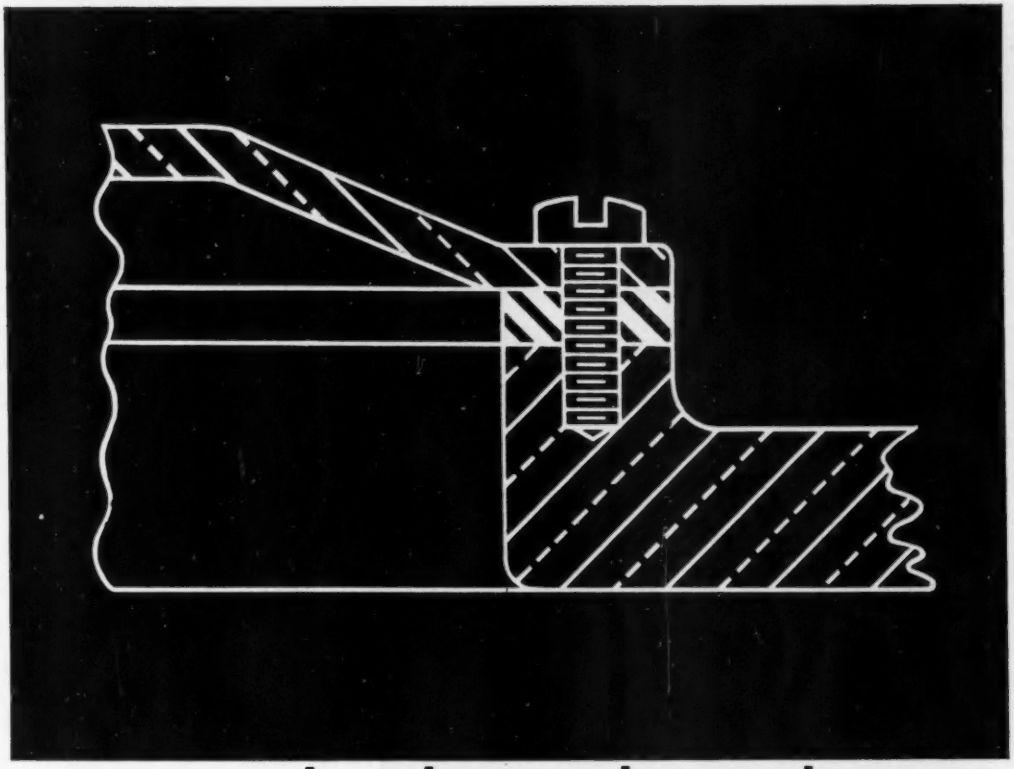


Steering gear | King pin (Front axle)

133 a 137 BOULD NATIONAL — NADELLA — RUEIL-MALMAISON (S.O.) FRANCE



How to seal rough cast and stamped parts

Effective sealing of rough cast and stamped parts requires that the sealing material be compressible enough to (1) seal the irregularities common to stamped parts and (2) fill the pits in the face of the rough casting under bolting pressure light enough to avoid distorting the stamped cover.

Shown in the above drawing is a typical rough cast and stamped joint. With lightweight stampings of this type, cork finds wide use. It compresses easily under the "peaks" of the stamping and at the same time has sufficient kickback under light pressures to fit snugly into the valleys, forming an effective seal.

With heavier gauge stamped parts requiring higher bolting pressures, Armstrong's Cork-and-Rubber Compositions may be used. These compositions are impervious to solvents, strong acids, or alkalies, providing a seal that is comparable in fluid resistance to straight rubber compounds.

Unlike straight rubber compounds, however, cork-and-rubber compositions decrease in volume under load. Compressed within its recommended range, a cork-and-rubber gasket will not sideflow appreciably. Consequently, it will conform to the flange surface rather than attempt to slide off. Neither will such a gasket extrude under normal pressure, a consideration where appearance of the finished unit is important.

In the case of high pressure sealing against a light gauge edge, resistance to extreme shear is as important as conformation to surface irregularities. Here one of the harder Armstrong's Rubber Compounds will provide an effective seal that minimizes the cutting action of raw metal edges.

Where synthetic rubber or cork-and-rubber gasket quantities are to be large, and gasket size permits, it usually is more economical to design the flanges to accommodate lathe-cut rings. These may be square or rectangular in section. In other cases, square or rectangular section cork-and-rubber ribbon may be used to effect savings. Check with your Armstrong representative about sizes and lengths available.

For further information on gasket selection and design, call your Armstrong representative or refer to Armstrong's Gasket Materials manual in Sweet's file for product designers. For a personal copy of this manual, write to the Armstrong Cork Company, Gaskets and Packings Department, 1503 Arch Street, Lancaster, Pennsylvania.

ARMSTRONG'S *Gasket Materials*

whatever your job for synthetic rubber

In hundreds of industries, users of Acadia Synthetic Rubber component parts have found them unsurpassed. So, no matter what function synthetic rubber must perform in your plant, depend on Acadia parts. They best meet exacting specifications and operating conditions such as moisture, oil, heat, wear and age resistance. Molded, extruded, die-cut to close limits – compounded to meet specific conditions. Acadia engineers will gladly cooperate.

• Seals • Gaskets • Washers • Cups • Channel • Strip • "O" Rings
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PRECISION DOWEL PINS

. . . specially hardened (58-60 Rockwell C) to resist upsetting—easier to drive with tapered leading ends to "pilot" the pin into the hole.

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DANLY TOOL, DIE AND GAGE MAKERS' SUPPLIES

assure tool and die makers of standard part quality fully consistent with good tool making practice. The Danly line includes many items in addition to those shown here such as set screws, bushings, toggle clamps and laps. A nation wide system of completely stocked Danly branches* assures quick, convenient delivery.

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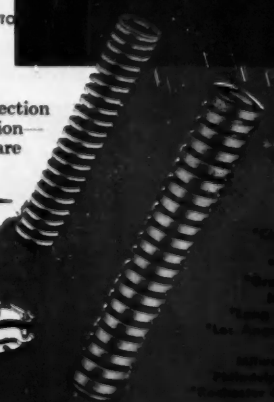
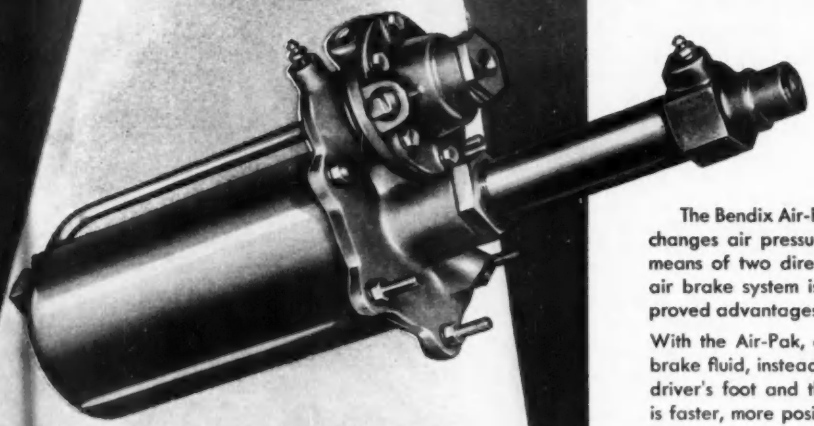


WHICH DANLY BRANCH IS CLOSEST TO YOU?

Bendix AIR-PAK

An Air Brake System that Revolutionizes Heavy Vehicle Braking!



The Bendix Air-Pak is an air-hydraulic unit that changes air pressure into hydraulic pressure by means of two direct connected pistons. Thus an air brake system is combined with all the well-proved advantages of hydraulic brake actuation.

With the Air-Pak, a non-compressible column of brake fluid, instead of air, connects between the driver's foot and the brake shoes. Brake action is faster, more positive and under better control. Also, brakes can be applied instantly by foot-power alone—a valuable emergency stand-by if brakes are needed before air pressure builds up, or if air pressure fails for any reason.

The Air-Pak is similar in design and principle to the well known Bendix* Hydrovac*, vacuum-hydraulic braking unit, in use today on more commercial vehicles than any other power braking system. Bendix has built more than 2½ million Hydrovacs; thus the Air-Pak has a matchless background of related engineering and manufacturing experience.

A descriptive folder on Air-Pak will be sent on request.

*REG. U. S. PAT. OFF.

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High Spots of This Issue

★ Planetary Gears for Automatic Transmissions

Discussed in this article is planetary gear design for automatic and semi-automatic transmissions. Of valuable use are charts illustrating the ratio limitations of the simple, double sun gear, double ring gear, and double planet types of planetary gearsets. Page 26.

★ Machining Chrysler's New V-8 Engine

A sampling of major operations on the cylinder block and cylinder head are given in this article. A second article, to be published later, will deal with the machining of crankshaft and pistons. Some of the novelties in production techniques are said to be as outstanding as the design elements of the engine itself. See page 30.

★ Ausco's Diversified Production Facilities

Modern, self-contained and windowless Hartford plant of the Auto Specialties Mfg. Co. is devoted to manufacture of Lambert disk brakes and clutches for tractors, and will soon produce a line of passenger car disk brakes as well. Joseph Geschelin takes you through the plant, page 38.

★ Large Chassis Assembly in British Plant

For the production of truck and bus chassis, a three-sectioned conveyor nearly 1000 ft long has been installed by Leyland Motors, Ltd., England. This interesting picture-sequence visualizes its operation. Page 42.

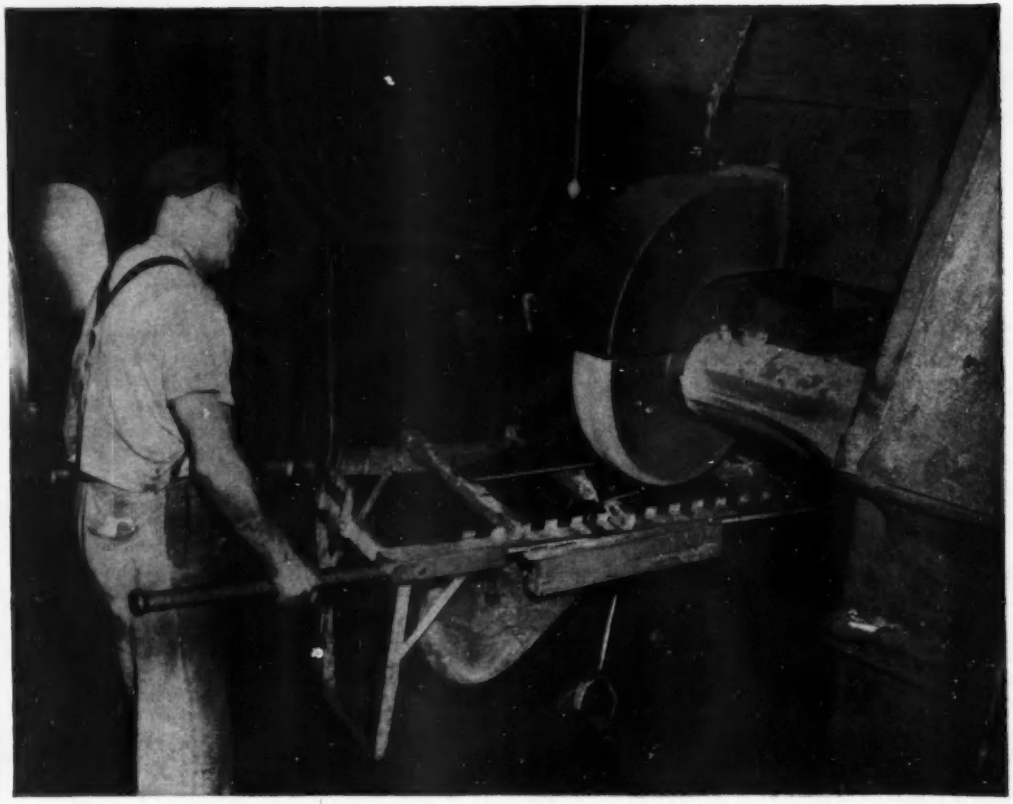
★ Two New Inspection Devices

Of more than uncommon importance are recent additions to Ford equipment for quality control. One is the automatic inspection machine for cylinder bores. The other is an instrument for the precision checking of gears and camshafts. Turn to page 44.

★ 26 New Product Items And Other High Spots, Such As:

Fiber consumption in textiles used for passenger car interiors; a new helicopter powered by twin ram jet engines; two new military trucks—the M-41 and M-51; the doubling of the size of the Aeroproducts plant; a throttle return check on the Powerglide carburetor; and announcement by Hotchkiss of an all light-alloy car.

News of the Automotive Industries, Page 13
For Complete Table of Contents, See Page 3



Why a Set-up Wheel?

For producing certain finishes and shapes today — there is no substitute for set-up wheels. In an increasing number of cases, however, belts and other abrasive products by CARBORUNDUM are coming into use, with marked success, where polishing grain had previously been used exclusively.

Behind this changing production pattern are new machines and techniques — matched at every step by new developments in abrasives and abrasive applications by CARBORUNDUM. Of equal importance to you, the user of abrasives, is our impartial recommendation of those abrasives best suited to your own job requirements.

Your CARBORUNDUM representative is a trained specialist who will be glad to help you select and apply abrasive products — including those which incorporate the latest developments in the field . . . whether they be polishing grain, coated or bonded abrasives.

Next time, call in CARBORUNDUM.

Only CARBORUNDUM
TRADE MARK

makes ALL abrasives to give you the proper ONE

"Carborundum" is a registered trademark which indicates manufacture by The Carborundum Company, Niagara Falls, N.Y.

News of the AUTOMOTIVE INDUSTRIES

Vol. 104, No. 5 March 1, 1951

Chrysler Gets Site for Proving Ground

Chrysler Corp. has acquired a 3800-acre site about 50 miles west of Detroit for a passenger car and truck proving ground. The announcement cleared up a long standing mystery in the area, since identity of the option purchasers on the property had been kept secret. Construction of buildings required for the operations will begin soon. The Chrysler test area is about three times the size of the GM proving ground at Milford, Mich.

Willys Earnings Show Sharp Increase

Willys-Overland net earnings for the three months ended Dec. 31 were 20 times higher than for the same period in 1949. Net profit was more than $1.5 million for the quarter, compared with $75,205 for the same period a year previous. Net sales were up 110 per cent to $42.9 million, compared with $20.3 million for the same three months of 1949. The company currently has large military orders for Jeeps and other vehicles, engines, and parts. At the end of last year, total backlog of unfilled military and civilian orders stood at $173 million.

Boeing and Bristol Sign Agreement

Providing for technical collaboration in research and development work on certain defense projects of common interest, an agreement has been signed by Boeing Airplane Co. and Bristol Aeroplane Co. of Bristol, England. Under the agreement, Boeing will provide Bristol with engineering data already developed by Boeing in the field covered by the agreement. Thereafter there will be a mutual exchange of technical information on further work of the two companies in the same field.

RFC Loan Helps K-F Weather Strike

The RFC has revealed that the Kaiser-Frazer Corp. borrowed more than $7 million to meet expenses during its recent 10-day strike. The money came from a $25 million loan granted by RFC to K-F last Dec. 4. Previously, K-F had borrowed $7,247,641 to finance its operations but had paid back the money. The loan agency granted an identical sum to K-F to carry its obligations during the strike, when its income was cut off. Originally, the company had asked for $18 million to meet its obligations, but the amount was reduced to the $7 million plus figure. The RFC also said that K-F had received nearly a quarter of a million dollars worth of war contracts "at our request."

PURELY EXPERIMENTAL

Built by Buick for experimental purposes, this two-passenger XP-300 is powered by a 300-hp supercharged V-8 engine with a 10 to 1 compression ratio designed to drive it 150 mph, and is equipped with dual four-wheel air-cooled brakes. It was displayed for the first time at the Chicago Automobile Show on Feb. 17, and is one of two experimental models developed by Charles A. Chayne and Harley Earl, GM vice presidents. The other was Le Sabre, details of which were announced in Automotive Industries, Jan. 1. The XP-300 is mounted on a 116-in. wheelbase, it has an overall length of 192.5 in. and stands 39.1 in. high at the cowl. It is 80 in. wide, with an overall height of 53.4 in., and its ground clearance is 6.6 in. The XP-300 is equipped with two aircraft type carburetors. One feeds gasoline into the engine, the other methyl alcohol.

Chrysler Doubles Size of New Engine Plant

The Chrysler Corp. has announced that its new engine plant being built at Trenton, Mich., near Detroit, will be twice the size originally planned. Initial plans for the building called for a structure 840 by 600 ft which would be equivalent to about 500,000 sq ft. Plans have been revised to call for a building 1680 by 600 ft, which would be slightly more than one million sq ft in area. The company says that the new plant will be used to build engines for trucks and passenger cars as well as replacement engines and will relieve congestion in other Chrysler engine building operations. There is also a possibility that the plant may be used for war work.

British Car Output in 1950 Up 25 Per Cent

In 1950 British automobile production reached the record level of 785,217 units. This was an increase of 25 per cent over the preceding year. Passenger cars numbered 522,515, while utility vehicles of all types totaled 262,702. Exports absorbed 69.2 per cent of total production, the number being 398,302 passenger cars and 145,289 trucks and other commercial vehicles. These figures are up 55 per cent over 1949. The home market was allotted only 30.8 per cent of national production, or 241,626 vehicles.

BRAND NEW DIAMOND

The new 1951 Diamond T heavy-duty line covers the field from 3 tons to 10 tons and up with new models 660, 720 (shown above), 722, 920, 921 and 921R for which many special options have been added.

Diamond T Announces New 1951 Heavy-Duty Line

The 1951 Diamond T Motor Car Co. models (see cut on this page) carry the new Diamond T full-vision safety steel cab with full de luxe equipment. Windshield is a single full-width sheet of curved laminated safety plate glass without obstructive center post.

Condensed specifications of the new line follow:

	660	720 & 720H	722 & 722H
GVW	23,000	25-30,000	25-30,000
GCW	50,000	50,000	50,000
Engine	Continental T6427	Continental T6427	Hercules TDXB
Brake Horsepower	162 at 2700 rpm	162 at 2700 rpm	162 at 2600 rpm
	920	921	921R
GVW	33,000	28,600	30-36,000
GCW	65,000	55,000	60,000
Engine	Continental R6572	Cummins HB-600	Cummins HRBB
Brake Horsepower	190 at 2600 rpm	150 at 1800 rpm	175 at 2000 rpm

British Car Prices Move Upward

Automobile prices are definitely on the upward move on the British market. Ford was the first to announce increases and has been followed by the Rootes group, Renault, Vauxhall and Austin. The increases vary from $56 in the case of Vauxhall to $280 for some of the Austin models. Purchase tax has to be added to these increases in the basic price. All manufacturers give the increased cost of raw materials as the reason for these higher prices.

International Harvester Rescinds Price Cuts

The International Harvester Co. has restored price increases that it rescinded in January when the government asked all businesses to roll back prices to the Dec. 1 level. During December the company had increased prices of motor trucks by $25 to $100 and farm implements and tractors by four per cent.

Ford Coordinates Program for Disaster Defense

As part of its comprehensive disaster preparedness program, the Ford Motor Co. has appointed a security committee charged with responsibility for developing procedures and organization. It will deal with protection of lives and property in the event of an enemy attack and will include protection against sabotage and other forms of internal attack and espionage involving confidential records, processes, and facilities. John S. Bugas, vice president-industrial relations, committee chairman.

NPA Limits Types and Styles of Tires and Tubes

The National Production Authority has ordered a reduction in the number of types and styles of tires, inner tubes and industrial rubber goods that a manufacturer may produce. White sidewall tires have been eliminated by the order, and it is expected that this will save 10 per cent on the amount of natural rubber that goes into these tires, since natural rubber must be used to make a white finish on any rubber product. The order permits manufacturers of truck tires to make one line each of standard tread-depth and extra tread-depth tires, and the manufacturer may not make more or different lines of special purpose tires than were being made when the order became effective.

Farm tractor and implement tires are limited to a single line, and passenger car tires are limited to black sidewalls only. In standard tread-depth passenger car tires, a manufacturer may produce only one line and one quality. Only one line of extra tread-depth passenger car tires may be manufactured, and the number of these tires that a manufacturer may make in any calendar quarter may not be in greater proportion to his total production of passenger car tires than it was in the last six months of 1950. A manufacturer may not produce more or different lines of special purpose passenger car tires than he was making when the order became effective. All other pneumatic tires—including those for motorcycles, bicycles, derby racers and scooters—may be made with black sidewalls only. A manufacturer may produce inner tubes in any color, but only in one color.

The NPA has also directed producers of high tenacity rayon tire cord yarn to accept DO rated orders up to 15 per cent of their scheduled monthly production. The high tenacity rayon yarn is used chiefly in the production of tires, but it also has other defense uses, such as in cargo and flare parachutes and airplane fuel cell fabric. After April 1, the NPA has prohibited the use of aluminum for automobile hardware and trim.

Allis-Chalmers Subsidiary Gets Canadian Unit

All of the physical assets of Canadian Allis-Chalmers, Ltd., have been bought by a new wholly owned subsidiary of Allis-Chalmers Manufacturing Co. of Milwaukee, Wis. The new subsidiary is known as Canadian Allis-Chalmers (1951) Ltd.

Announce More War Contracts

Chevrolet has a letter contract from the air forces for production of jet aircraft engines. The number of units involved or dollar value was not disclosed, but the order is the largest single military contract in the division's history.

Assembly will be in a large government-owned plant adjoining the Chevrolet Tonawanda plant near Buffalo which Chevrolet operated during World War II for production of P. & W. radial engines. In 1945 the operation was changed over to jet engines, and production had barely started before the war ended. Components and sub-assemblies for the engine will be built in Chevrolet plants and by outside suppliers. The specific engine which Chevrolet will build was not officially disclosed, but it is understood to be a new type developed by GM's Allison Div. Tooling and other preparatory work will take at least the rest of this year, with production and tests scheduled to start in 1952. Packard has been awarded military contracts totaling $20 million for building Diesel engines and parts for the navy. The order covers a "family" of engines with 6, 8, 12 and 16-cylinders ranging up to 800 hp. A four-cyl 135-hp engine is also in the series as well as complete accessory assemblies. The engines are said to develop more horsepower per pound of engine weight than any marine Diesel in production.

GM's Buick Motor Div. has been awarded a large contract to build J-65 Sapphire jet engines for the Air Forces. The size of the contract was not announced, but a facilities letter contract for $25 million indicates that the order is one of the largest yet made. It is estimated unofficially that the size of the order will be in the neighborhood of $300 million. The J-65 will be built under license from the Wright Aeronautical Div. of Curtiss-Wright Corp. which holds the American patents on the British engine. It will be used in the Republic F-84 Thunderjet which GM will build at Kansas City. The engine is rated at 7200 lb thrust, weighs 2500 lb, and is slightly more than 12 ft long. U. S. Rubber Co. has reactivated the large Kankakee Ordnance works for the manufacture of high explosives under a contract with the U. S. Army Corps of Engineers.

Other automotive military contracts include a $15.9 million order to Chevrolet for four-door sedans; GMC Truck & Coach $30 million order for trucks; Studebaker contract for cargo trucks totaling $12.3 million; Reo Motors, Inc. $11.5 million order for gas tank trucks; an additional $8 million order to International Harvester for 3050 trucks; Federal Motor Truck Co. $3 million order for trucks; a contract for $1 million to Continental Aviation & Engineering for design and construction of prototype Diesel engines; and a $750,000 contract for generator sets to Hill Diesel Engine Corp. Chevrolet is negotiating with Army Ordnance to reopen the shell plant in St. Louis which it operated during World War II. The plant has been on a standby basis since the end of the last war and is equipped with heavy forging presses and other equipment.

Continental Aviation & Engineering Corp. has been granted a $7 million order for helicopter engines to be used by the Navy. Airtemp Div. of Chrysler Corp. at Dayton has been given a contract for a large quantity of range finders. Construction of a new 72,000 sq ft addition to the plant will begin immediately to house part of the work with the remainder being carried on in the current plant. North American Aviation Corp. has been awarded a contract for production of airplanes and related equipment totaling about $7.7 million.

Firestone Tire & Rubber Co. will operate the Ravenna, O., arsenal ammunition loading facilities for the Army. Under its contract Firestone will take over the operation about April 1. Fairchild Engine & Airplane Corp. has leased a 150,000-sq ft government plant at Valley Stream, L. I. for production of parts for jet and other type aircraft engines. Fairchild has also purchased a 32-acre site on Long Island where it plans to build a one million sq ft defense plant. GM's Frigidaire Div. will undertake a large part of cargo plane propeller production. GM's Aeroproducts Div. which designed the propeller for use on cargo and troop transport planes will also handle part of the production. Chrysler has announced that its $100 million order for Continental aircooled V-12 tank engines will be centered in the Michaud plant in New Orleans. The plant was used by Higgins, Inc. during World War II for production of engines for the Navy. Kaiser-Frazer has a contract to build an undisclosed number of Wright R-1300 aircraft engines for the Air Force. Tooling and conversion of the company's Detroit engine division plant are already under way. Production of automobile engines will continue at the plant and additional space will be required for the aircraft contract.

GM's AC Spark Plug Div. has been awarded a $4.2 million award for a large quantity of new type aircraft spark plug to be used in the Pratt & Whitney R-4360 engine used to power the B-36 bomber.

Link Aviation Inc., Binghamton, N. Y., has revealed that it will increase its production force to handle government contracts totaling $20 million. The company's latest contract, is a $10 million order for jet fighter trainers.

The Twin Coach Co.'s order backlog totals over $70 million. The company's Kent, O., bus plant now has $32 million in orders on hand, including a recent $21 million Army award for Twin Coach Convertibles, combination passenger, ambulance and cargo vehicles which can also be adapted for use as mass evacuation units. The Twin Coach aircraft division in Buffalo has also recently received additional defense contracts, and its backlog is now about $38 million.

Breda Company of Italy Announces New Plane

The Breda company in Italy has announced the new B.P.471 airplane de-

HYDRAULIC CONTROL

Allis-Chalmers has announced this new model CA farm tractor and its complete line of hydraulically - controlled companion implements. The unit, with a 125- cu in. engine, has complete hydraulic control for implements including automatic traction booster; Allis-Chalmers powershift rear wheel spacing; and two-clutch power control.

signed by Mario Pittoni. The new airplane has been designed for passengers or cargo, as well as for aerial photography or for training new pilots in blind flying. It has W-shaped wings and is powered by two Pratt and Whitney Twin Wasp SIC3-G engines, each of which develops 1215 hp. at take-off. Its normal top speed is 292 mph, and its ceiling is 23,600 ft.

Excess Profits Tax Cuts Nash Net

Nash-Kelvinator Corp. has revised its earnings downward for the fiscal year ended last Sept. 30 because of the excess profits tax act, which reduced income by approximately $1.7 million. After provision for the additional tax, earnings were $28.8 million compared with an earlier report which had indicated that profit would be $30.5 million for the year. For the first quarter of its current fiscal year, the three months ended Dec. 31, the company has reported net earnings of slightly more than $5 million. For the same period a year ago, profit was $4.2 million.

SAE National Meeting in Detroit, March 6-8

This year the SAE National Meeting scheduled for March 6-8 in Detroit will cover only passenger car and body engineering. The Production Clinics held in conjunction with this meeting in 1949 and last year are not on the program for the meeting in March. The SAE Production Activity decided last year to shift the meeting to another location so as to spread its value to other parts of the country. Consequently, a production forum is being scheduled in connection with the SAE National Tractor Meeting which will be held in Milwaukee in September, 1951.

Cummins Not to Enter Diesel Racer in Indianapolis

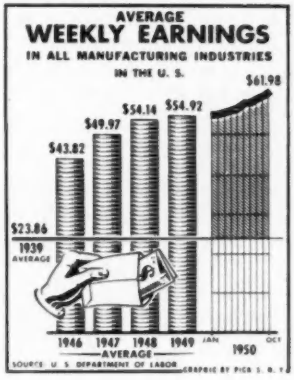
Plans for entering the Cummins Diesel Special No. 61 in the 1951 Indianapolis Speedway classic have been shelved by the Cummins Engine Co., Inc., Columbus, Ind. The company stated that the tremendously expanding demand for Cummins Diesels as well as the continuously accelerating requirements during the present national emergency, precludes the allocation of time and manpower needed to prepare the car for the 1951 race.

Car Builders Blast Excise Tax Boost

Reaction to the government's proposal for an increase in the Federal excise tax on passenger cars to 20 per cent from the current seven per cent rate has raised a storm of protest in the automobile industry. The Automobile Manufacturers Association through its general manager, William J. Cronin, says that automobiles are not a luxury item and should not be taxed as such He points out that federal excise taxes already total about $93 on the average new car, and that if the proposed increase were to be levied it would add an additional $172 to bring the total to $265. He attacked the assumption that automobiles are strictly pleasure vehicles as an obsolete theory, and cited surveys which showed that more than half of all car use is for necessary purposes. Experience during the last war, he said, showed that between 75 and 100 per cent of defense workers reached their jobs in cars because no other transportation means were available. He added that the problem is even more intensified because of the population move to outlying suburbs during the last decade.

French Car Output in 1950 Boosted 25 Per Cent

French automobile production for 1950 shows an increase of better than



25 per cent over the preceding year, with a total of 357,552 vehicles, of which 257,292 were passenger cars, 97,981 were trucks and 2279 were buses or coaches. In 1949 total production was 285,641 automobiles. The biggest producer was Renault, followed by Citroen, Peugeot, Simca, Ford and Panhard. Exports totaled 117,313, being an increase of 14.7 per cent over the preceding year. They comprised 89,656 passenger cars and 27,657 commercial vehicles of all types. Foreign countries absorbed 72,592 automobiles, while the French Union took 44,721.

Official returns show that sales on the home market totaled 240,239. Exports, therefore, were 32.8 per cent of total production. Despite the relatively high proportion of cars for the home market, requirements are not being met, and delivery dates vary from two months to two years, according to make. Factory capacity will increase this year. Renault is building an entirely new factory at Fers, to the west of Paris, and Simca expects to have the new installa-

SPORT FOR FOUR

Priced at $1895 delivered in either U. S. East or West Coast ports, this new Austin four-passenger sports convertible on the A40 chassis, introduced by the Austin Motor Co., Ltd. (England), is powered by a four-cyl 46-hp engine with twin carburetors. It has a wheelbase of 92½ in.; overall height, 57 in.; and overall length, 159¼ in.

tion, made possible under Marshall Aid, in operation by May. Up to the present, the rearmament program has had little or no effect on automobile production.

Body Engineers Elect Garman President

Harry G. Garman has been elected president of the American Society of Body Engineers for 1951. He is associated with GM's Fisher Body Div. Other officers elected include Harold V. Atnip of Chrysler Corp., vice president; Gordon J. Lawton of Briggs, secretary; and Edward L. Pangborn of Chrysler, treasurer. 1951 trustees are: I. Lewis Carron, Carron Co.; Lynn A. Fill, Motor Products; William K. Norwick, Fisher Body; Charles Bugbee, Ford; Stanley C. Vahey, Budd; L. James Berridge, Woodall Industries; and Arthur L. Bradley, Creative Industries.

USAF Design Competition for Convertiplane

A design competition for the construction of an observation-reconnaissance airplane that can take-off and climb vertically and then fly like a conventional plane is being conducted by the United States Air Force. The plane would be used mainly by the Army Field Forces and the Air Force's Air Rescue Service. Seventeen aircraft companies have already submitted designs for such an airplane. The designs are now being evaluated in the aircraft laboratories of the Air Materiel Command at Wright-Patterson Air Force Base, Dayton, O. To achieve these two specific performance characteristics, an aircraft must be developed which is capable of changing its axis of thrust from vertical to horizontal and back to vertical while in flight.

FTC Issues New Rules for Car Time Sales

General reaction to the recent FTC promulgation of five unfair trade practices in automobile installment sales and financing is that they will have little effect on operations of legitimate dealers. The practices which FTC has prohibited as being unfair are: (1) misrepresentation by the seller of insurance coverage or rates or financing costs or rates; (2) failure to furnish an itemized list detailing total delivered price, accessories or extras, down-payment and trade-in credits, time balance, amount and due date of each installment, insurance cost coverage, and financing charge; (3) inducing the buyer to sign an installment sale contract or receipt in blank; (4) use of rate charts to deceive or mislead the buyer; and (5) requiring the buyer to purchase insurance from a particular company when equivalent or better coverage is available to and preferred by the buyer.

FOR CIVILIAN DEFENSE

This new Chrysler ambulance for civilian defense projects, police, hospital and other first aid uses combines the features of the Chrysler Town and Country wagon with the special ambulance features required of a versatile emergency unit. The entire rear passenger seat of the new ambulance can be folded forward to accommodate two collapsible stretcher-cots. The body is mounted on the Royal chassis of 125½ in. wheelbase and overall length of the vehicle is 211⅛ in. The car is powered by the 116-hp Chrysler engine.

Milo Dean Heads New Loewy Department

Raymond Loewy Associates, industrial designers, have instituted a department of development engineering under Milo M. Dean, former chief engineer of the Greyhound Corp.

Steel Cut Order Anticipated by Car Makers

Initial reaction among automobile manufacturers to the forthcoming order limiting use of steel, effective April 1, to 80 per cent of average monthly use during the first six months of last year was that at least it was not as bad as could have been. Earlier government officials had been talking about a 40 per cent reduction. By the time the steel order takes effect automobile production will probably be down very close to 20 per cent under the base period for individual companies so that the reduction in steel use may not be felt too greatly. In fact automobile companies had already scheduled cutbacks. The new order will be on a specified list of products, including automobiles, and differs from previous limitation orders in that it applies to manufacturers and assemblers of finished products as well as suppliers. At the same time the order reduces use of copper another five per cent and retains the limitation on aluminum at 65 per cent of the base period. A point not yet cleared up is whether or not the aluminum order will be eased on functional items to permit 75 per cent use as has been the case thus far. The order also required that companies continue to use the same percentage of conversion steel that they used in the last half of last year. Since conversion steel is costly, that part of the order works a hardship on the industry, particularly in view of the rigid price controls on end products.

Car Cutback Threatens Financial Hardship

A 40 per cent cut in automobile production by the middle of this year could reduce 1951 passenger car output to between 3.75 and 4 million units, according to R. L. Polk & Co. While that figure might not seem too bad in view of performance in most prewar and some postwar years, closer analysis reveals that it could be a serious matter for the automobile industry. Performance in 1949 and 1950, when 5.1 million and 6.25 million passenger cars were produced and sold, indicates clearly that the national economy needs and will absorb a much higher production than will be turned out this year. Comparison of previous years must also take into account the greatly enlarged capacity of the industry today, which is 6.25 million cars without straining too much, so that a reduction to 60 per cent raises some serious problems in relation to the breakeven point unless the unused capacity is utilized for other activities, such as war work. Actually, the billions of dollars in defense contracts

granted to the automotive industries will not be felt until very late this year to any great extent. Even so, current procedure of placing most large contracts in plants not used for automotive production and in many cases far removed geographically from present automotive plants creates another problem in that automotive production is to be carried on at about half speed, greatly increasing overhead costs.

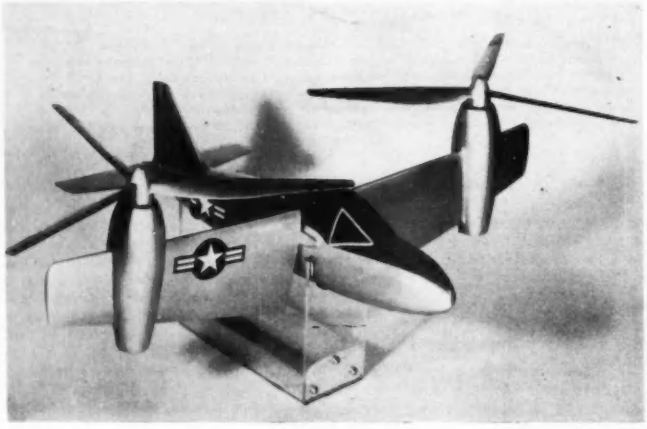
ASTE to Hold Annual Meeting in New York City

The theme of the four-day annual meeting of the American Society of Tool Engineers, opening in New York City on March 14, will be mobilization of production know-how. The military will be represented at this conference by top-ranking officers from armed forces. Top American industrialists, besides those who are members of the ASTE, have been asked to attend and participate in the conference.

The meeting will be in the form of an open forum to help develop the best ways for industry and the armed forces to work together in correlating available production techniques with military requirements. The technical sessions have been designed to give as much usable, up-to-date material as is possible to the men responsible for planning the nation's defense on the industrial front. A total of 34 papers will be presented.

Hughes to Build Electronics Plant in Arizona

Hughes Aircraft Co. will build an electronic manufacturing plant near Tucson, Ariz., according to company officials. Ground has been broken a few miles southwest of the city, adjacent to the Tucson Municipal Airport. The plant is expected to be completed in about six months, and 1500 workers are anticipated by the end of the year.



TWO IN ONE

This scale model of a proposed convertible aircraft or convertiplane (combination of a helicopter and conventional fixed wing aircraft) by Wayne University shows the helicopter operation stage; rotor axes tilted to the vertical position, providing direct lift for the aircraft. The wing is rotated with the rotors, and remains in a vertical position during this flight stage. For forward flight the rotor is tilted gradually with simultaneous movement of the wing. When the rotor axes and wing attain an approximately horizontal position the aircraft is in the normal winged flight.

U. S. Rubber Producing Gilmer Timing Belt

The U. S. Rubber Co. has started large-scale production of a rubber and fabric belt with teeth, known as the Gilmer Timing Belt. It will reportedly attain speeds up to 16,000 fpm. The belt is now in production in the L. H. Gilmer plant at Philadelphia, Pa., and it will be marketed initially through the L. H. Gilmer division. Production currently is limited to specifically engineered applications. However, the company expects to offer a standardized line of stock drives in both heavy and light duty constructions with a sufficient number of pulleys to give an adequate range of speed ratios.

Caterpillar Starts New Mobilization Plan

The Caterpillar Tractor Co. has announced that by mid-year it will be operating under an industrial mobilization plan calling for 62 per cent of its production for the military forces and 38 per cent for essential use. The plan is the first of its kind in the construction industry and is being used by the military as a model for developing similar plans for other industries. Caterpillar has a $42 million contract for large tractors, bulldozers, cable controls, and allied equipment. The contract carries a DO rating for priority assistance in obtaining scarce materials. Caterpillar last year had a net profit of $29.2 million representing 8.7 per cent of sales totaling $337.2 million.

Continental Nets $3.6 Million in 1950 Fiscal Year

Continental Motors in its last fiscal year ended Oct. 31 experienced a sharp increase in earnings with profit at the highest level in five years. Earnings totaled $3,611,245 compared with $1.8 million the previous year. Sales in the 1950 fiscal year were 31 per cent ahead of 1949. Continental currently has large military commitments, but details as to size and dollar volume were not revealed in the report. It is known, however, that orders exceed $100 million.

Doubling of Fruehauf Shares Approved

Stockholders of Fruehauf Trailer Co. have approved doubling the number of authorized shares of common stock. At a special meeting, shareholders authorized an increase in the number of $1 par value common stock shares to 3 million from 1.5 million.

Westinghouse's 1951 Tool Forum in Pittsburgh

The 1951 Machine Tool Electrification Forum, sponsored by Westinghouse Electric Corp., will be held in Pittsburgh, Pa., on April 10 and 11. The following program has been announced by J. J. Smith, Jr., Industry Department, Westinghouse, general chairman of the Forum: April 10—Opening Remarks, F. D. Weatherholt, manager, Industry Department, Westinghouse, East Pittsburgh, Pa.; "Introduction to Defense," Tell Berna, general manager, NMTBA, Cleveland, O.; "Conservation of Manpower and Materials," M. S. Curtis, director of engineering, Warner and Swasey Company, Cleveland, O.; "Determining Factors in the Use of Hy-

draulic, Electrical, and Mechanical Drives," E. J. Rivoira, executive engineer, Cincinnati Milling Machine Co., Cincinnati, O.; NMTBA Electrical Committee Report by its chairman, J. J. Jaeger, assistant chief engineer, Pratt and Whitney Div., Niles-Bement-Pond Co., West Hartford, Conn.; New Developments and Applications," L. W. Herchenroeder, industry engineer, Westinghouse, East Pittsburgh, Pa.

April 11 — Discussion of Priorities and Allocations, government representative from the machinery division of the National Production Authority, Washington, D. C.; "Temperature Ratings of Motors," W. H. Formhals, section manager, A-C Motor Engineering Department, Westinghouse, Buffalo, N. Y.; "Press Control," K. B. Rexford, electrical engineer, Hydraulic Press Manufacturing Co., Mt. Gilead, O.; "Wiring and Wire Grouping on Large Machines," William Stuebbe, chief electrician, G. A. Gray Co., Cincinnati, O.

Military May Hoard Machine Tools

A report from the machine tool industry indicates that NPA may soon order tool builders to build machine tools, such as boring and milling machines, in advance of military requirements. The reason for such a move would be to make the equipment available for immediate delivery when required for military work. The machine tool industry is already many months behind on orders for such equipment from civilian users.

Turin Automobile Show to Have Over 400 Exhibitors

With covered area increased to 200,000 sq ft, the Italian automobile show at Turin, from April 4 to 15, has united more than 400 exhibitors, representing seven nations. England leads with 20 makes of passenger cars, followed by the U. S. A. with 19, Italy 9, France 6, Germany 4. There are nine manufacturers of truck and coach chassis. Foreign cars sent for exhibition purposes can be sold on Italian territory, the concession under this heading being bigger than last year. Several technical congresses will be held during the show week.

Employe Suggestion Plan Successful at Buick

Employe suggestion plans have caught on well in the automobile industry. Buick reports that last year it paid out $59,765 to 851 employes for suggestions that improved operating efficiency, safety, and quality of product. Five maximum awards of $1000 savings bonds were made during the year with one employe winning two of the $1000 bonds. The number of suggestions made last year totaled 5439. This year the maximum award has been increased from $1000 to $2500.

Rheem to Build New Plant Near Los Angeles

Rheem Manufacturing Co. has purchased a 50-acre site near its South Gate (Los Angeles area) plant and will build a plant especially designed to handle aircraft work. The new unit will have a manufacturing area of more than 200,000 sq ft.

FRB Survey Reveals Car Ownership

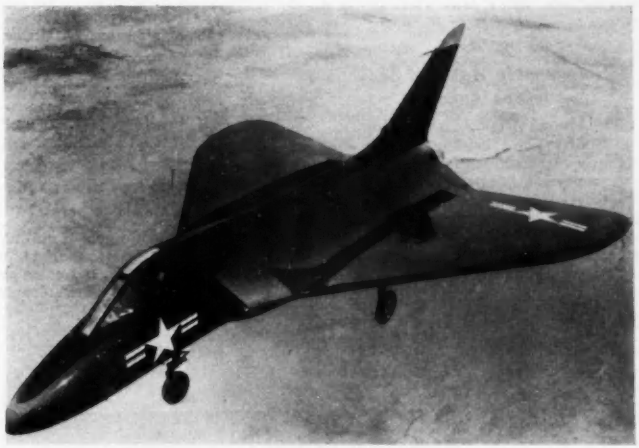
The Federal Reserve Board has come up with some interesting results from its recent survey of car ownership among various income brackets. The study revealed that 75 per cent of all automobiles are owned by families with less than $5000 annual income. Other results of the survey showed the following percentages of ownership in the various income brackets: Less than $1000, 5 per cent; $1000 to $2000, 11 per cent; $2000 to $3000, 19 per cent; $3000 to $4000, 23 per cent; $4000 to $5000, 16 per cent; $5000 to $7500, 16 per cent, and more than $7500, 10 per cent.

Collyer Urges Increase in Rubber Making

John L. Collyer, president of B. F. Goodrich Co., has urged the government to start immediate expansion of the nation's general-purpose American-rubber facilities to add 200,000 tons a year additional capacity. He said that such an increase would reduce the need for large scale purchases of additional crude rubber for stockpiling at inflated prices. Mr. Collyer, who was formerly special director of rubber programs for the government, said that the national stockpile of crude rubber is adequate to supply the military and essential civilian needs of the United States alone for a five-year war, but that this country would be called upon to supply large quantities of rubber and rubber products to our allies in the event of all-out war.

Self-Cleaning Plug Under Navy Test

A self-cleaning spark plug is reported under test for high compression airplane engines. A Pennsylvania manufacturer is reported to have developed a spark plug which will operate for 500



TAILLESS!

Successfully flown for the first time at Muroc, Calif., this new Navy Douglas XF4D jet fighter, is one of the first Navy fighters designed specifically for interception. The new interceptor has a swept wing with web-like planform and a slender nose extending forward to provide a cockpit. It has no tail.

hours without maintenance or adjustment. The new plug is being tested by a commercial airline and by the Navy. The manufacturer states that plugs embodying similar principles will be introduced later for automotive and industrial engines.

Buick Buys Tank Plant for Parts Warehouse

Buick has bought the government-owned Grand Blanc, Mich. tank arsenal which it has been using as a parts warehouse for the past five years. Buick leased the plant in 1946 and intends to continue using it as a parts warehouse. During the war it was operated as a tank arsenal by Fisher Body.

Hold Fourth Hot Rod Show in Los Angeles

The Fourth Annual Hot Rod and Motor Sports Show held in Los Angeles recently displayed a variety of automptive equipment from motorboats to a one-wheeled motorcycle. Fifty hot rods, plus sports cars, foreign cars, motorcycles and motorboats were viewed by approximately 80,000 people, according to Robert M. Barsky, managing director.

Solar Aircraft to Expand Facilities

Solar Aircraft Co., San Diego, Calif., announced planned expansion of its facilities in San Diego and Des Moines, Ia., to bring total plant area to more than one million sq ft. Employment in the two plants is expected to rise to more than 5000 by the end of the year from the present 3000 employees.

Ford Economist Joins ESA in Washington

Theodore O. Yntema, finance officer of the Ford Policy Committee, has been appointed chief economist of the Economic Stabilization Agency. He will head a new economic group within ESA to deal with long range stabilization programs and the basic causes and cures of inflation. Before joining Ford two years ago, he was chief economist and research director for CED and a consultant for several companies.

New Instrument Designs Require More Parts

Advancement in designs of military instruments since World War II requires 2½ to 4 times as many parts and a consequent increase in the demand for new tools and dies, according to the National Tool & Die Manufacturers Association. The group recently told the NPA that 20 to 25 per cent more trained tool makers are required by the industry to fill defense orders.

Complete K-F Plant in Israel

Work has just been completed on Kaiser-Frazer's new automobile plant situated on an 18-acre site in the Haifa Bay industrial area of Israel. The total building area will be about 150,000 sq ft, two-thirds of which are devoted to the assembly shops. The plant will employ about 300 persons and will turn out 20 cars and five trucks a day. Models selected for assembly in Israel are the four-door and two-door Kaiser sedans and Henry J and the Kaiser Traveler. Trucks will be of the Mack type.

In the first stages of its operation, the new plant will receive all required parts and raw materials directly from the U. S., but by the end of 1951, Israel factories are expected to provide about 15 per cent of the basic materials. This will be achieved by the establishment of a number of new factores to serve the Kaiser-Frazer plant, and planning in this direction is well advanced. Israel is expected to supply plastic and glass parts, paint, and possibly later, upholstery, electrical installations and wiring.

See Cut in British Car Production

Cuts of from 15 to 20 per cent in British automobile production are inevitable as the result of the reduction in the imports of sheet steel and the effect of the rearmament program. It had been expected that 140,000 cars and 65,000 trucks would be produced during the first quarter of the year, but since the announcement of the Ministry of Supply program this has become impossible. Factories are not equally affected, but some are going on a four-day week immediately.

An emergency meeting of the Materials Committee of the Society of Manufacturers & Traders has been called. This committee will make representations to the Ministry of Supply on the whole subject of steel and other material supplies. Manufacturers will make special efforts by using all initiative and improvisation possible to cooperate with the Government in minimizing the effects of the cuts, but in turn they ask the Government to see that fair allocations are made to the automobile industry as a whole to enable it to play its full part in the export drive, the provision of armaments, and the maintenance of employment.

WET TEST

Remaining in continuous operation for periods ranging up to four hours is this Reo Motors' new army truck, the Eager Beaver, during deep-water tests in Rainbow Springs, Fla. Army Ordnance test driver John Scott, of Aberdeen, Md., is shown as he swims back to his seat.

Men in the News

Current Personnel Appointments and Changes at Plants of Automotive Manufacturers and Their Suppliers

Allis-Chalmers Mfg. Co.—**William A. Roberts**, executive vice-president in charge of tractor division, was elected president. **W. C. Johnson**, formerly executive vice-president in charge of the general machinery division, was named executive vice-president. **J. L. Singleton**, formerly vice-president and director of sales, general machinery div., was named vice-president in charge of the general machinery division. **Fred Mackey**, formerly general works manager, general machinery division, was named vice-president in charge of manufacturing, general machinery division. **R. S. Stevenson**, formerly general sales manager, tractor division, was named vice-president in charge of the tractor division. **A. W. Van Hercke**, formerly director of engineering, tractor division, was named vice-president in charge of engineering, tractor division. **John Ernst**, formerly general works manager, tractor division, was named vice-president in charge of manufacturing, tractor division. **Edmund Fitzgerald**, president of Northwestern Mutual Life Insurance Co., Milwaukee, was elected a member of the board of directors.

Chrysler Corp., Plymouth Div.—**John P. Matsfield** has been elected a vice-president and a director of the division.

Kaiser-Frazer Corp.—**H. V. Lindberg** has been appointed vice-president.

Fram Corp.—**S. Everett Wilkins** has been elected as vice-president and general counsel.

Pyrene Mfg. Co.—**Wallace B. Phillips** has been elected president, succeeding **Edward J. Waring** who has retired.

Ford Motor Co.—**Ray Morrissey** has been appointed manager of manufacing engineering, engine and foundry div.

Sun Oil Co.—**Louis B. Wells**, has been named to the newly created position of manager of the company's refineries.

Electric Auto-Lite Co.—**I. O. Goodnight** has been promoted from assistant to treasurer. **G. A. Kessel**, has been named as assistant to the comptroller.

Bendix Aviation Corp., Bendix Products Div.—**W. A. Gebhardt** has been appointed assistant manager of Fuel Feed Engineering at the South Bend Plants succeeding **Henry G. Tarter.** He was formerly divisional patent attorney. **Thomas J. Plante**, patent attorney for the division, has been appointed divisional patent attorney.

Republic Aviation Corp.—**Philip P. Miller** has been appointed manager of labor relations.

Gisholt Machine Co.—**George P. Extrom** was elected as treasurer.

Mack Trucks, Inc.—Albert G. **Crockett** has been named special assistant to **H. W. Dodge**, executive vice-president.

United Aircraft Products, Inc.—**W. Thomas Stark**, formerly chief project engineer at Wright Aeronautical Corp., has been elected vice-president.

General Electric Co.—Three executive vice-presidents were elected: **Henry V. Erben, Hardage E. Andrews**, and **Roy W. Johnson.** Their headquarters will be at the G-E executive offices in Schenectady.

Brunswick Ordance Corp. (wholly-owned Mack Trucks, Inc. subsidiary)—**R. W. Walker**, vice-president of Mack Motor Truck Corp., was named executive vice-president and director.

Westinghouse Electric Corp.—The board of directors elected four new vice-presidents: **Tomlinson Fort**, who is manager of the company's headquarters apparatus sales department at Pittsburgh; **L. W. McLeod**, south western district manager, with headquarters at St. Louis; **Emery W. Loomis**, middle Atlantic district manager, Philadelphia. and **L. E. Lynde**, who has been New England District Manager at Boston, but now will head the company's Washington, D. C. government office.

Chrysler Corp.—**Cass V. Miller** has been appointed general personnel supervisor. **Mr. Miller** succeeds **Charles G. Eschenbach** who recently was appointed Assistant Director of Personnel.

Piasecki Helicopter Corp.—**Clarence B. Rex** has joined the corporation as controller.

Wagner Electric Corp.—**Herbert B. Nechemias** was recently appointed manager of the Industrial sales dept. succeeding **J. S. Smith** who was appointed Director of Purchasing.

Vanadium Corp. of America—**Roy F. Hancock** has recently been appointed assistant to the vice president in charge of sales.

The Electric Auto-Lite Co. — Harry G. Call has been named a vice - president in charge of the Pension and Insurance Department.

Bendix Products Div., Bendix Aviation Corp. —Henry G. Tarter, assistant manager of Fuel Feed Engineering, has been appointed general manager of the Hamilton Div.

Norton Co.—**Edwin E. McConnell**, controller, and **Lewis S. Greenleaf, Jr.**, formerly vice president in charge of sales of Durex Corp. and of Durex Abrasives Corp., were elected members of the board of directors. **Thomas S. Areen**, director, has retired.

The Electric Furnace Co.—**Richard E. Coe** was elected assistant to the president.

Chrysler Corp., Dodge Div.—**D. A. Geil** was appointed truck sales supervisor.

Walker Manufacturing Co.—**William C. Morgan, T. Faxon Hall, and Carl C. Nelson** were elected vice presidents.

Towmotor Corp.—**E. C. Iverson** was appointed chief engineer.

Necrology

C. W. Churchill, 70, president of the Chrysler Corp. of Canada, Ltd., died on Feb. 10 in Detroit, Mich.

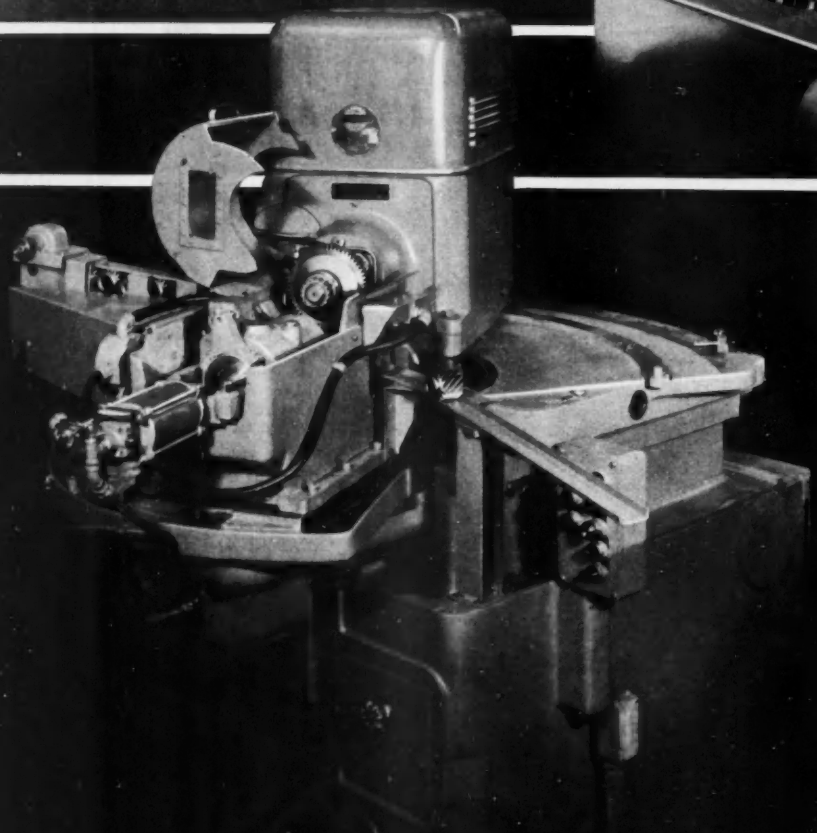
Robert Crooks Stanley, 74, chairman of the board of directors of the International Nickel Co., of Canada, Ltd., died Feb. 12 in Dongan Hills, Staten Island, N. Y.

Edward Joseph Helline, 48, general sales manager of the Reliance Div. of the Eaton Manufacturing Co., died Feb. 8, in Massillon, O.

W. L. Iliff, 60, manager of eastern sales, Hyatt Bearings Div., General Motors Corp., died Feb. 3.

Andrew J. Eldred, 57, president Autopulse Corp., died Jan. 7.

'Full Tool' Shaving...



GEAR SHAPERS
SHAVING MACHINES
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PLASTICS MOLDING MACHINES

still *faster* with Automatic loading and unloading

Magazine Feed Still Further Reduces the Operating Effort Required

Fellows 'Full Tool' Shaving is essentially an extremely high speed operation. ' ' ' The shaving time per gear or pinion can be so short that loading becomes an important time-economy factor. ' ' ' Hence Fellows optional addition of magazine type Automatic Loading and Unloading! ' ' ' The air-actuated work positioning, clamping and ejection are split-second timed into the automatic cycling of the machine. ' ' ' The resulting overall speed sets new standards—from which our engineers will be glad to quote rates on specific gears and pinions. ' ' ' For data, call on the nearest Fellows office.

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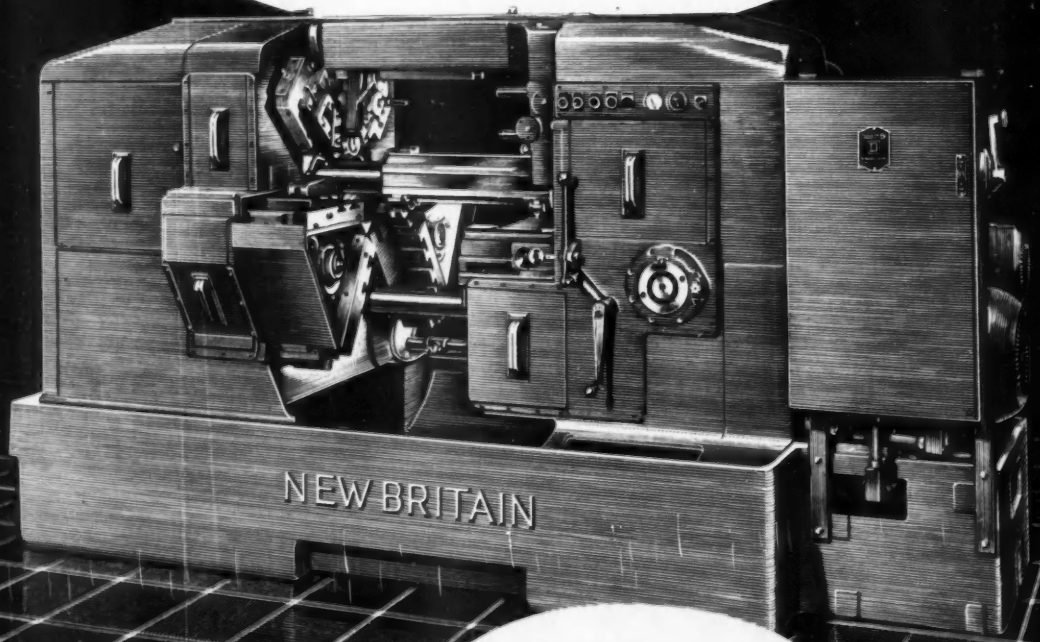
Greater Productivity

...More Horsepower...Less Man Power

TODAY American Industry is under pressure to meet fantastic demands. Only yesterday, intense competition was the problem. Manufacturers have found the answer to both situations in more productive machine tools. The New Britain-Gridley Division, The New Britain Machine Company, New Britain, Conn., U.S.A.

AUTOMATIC BAR AND CHUCKING MACHINES • PRECISION BORING MACHINES

LUCAS HORIZONTAL BORING, DRILLING AND MILLING MACHINES



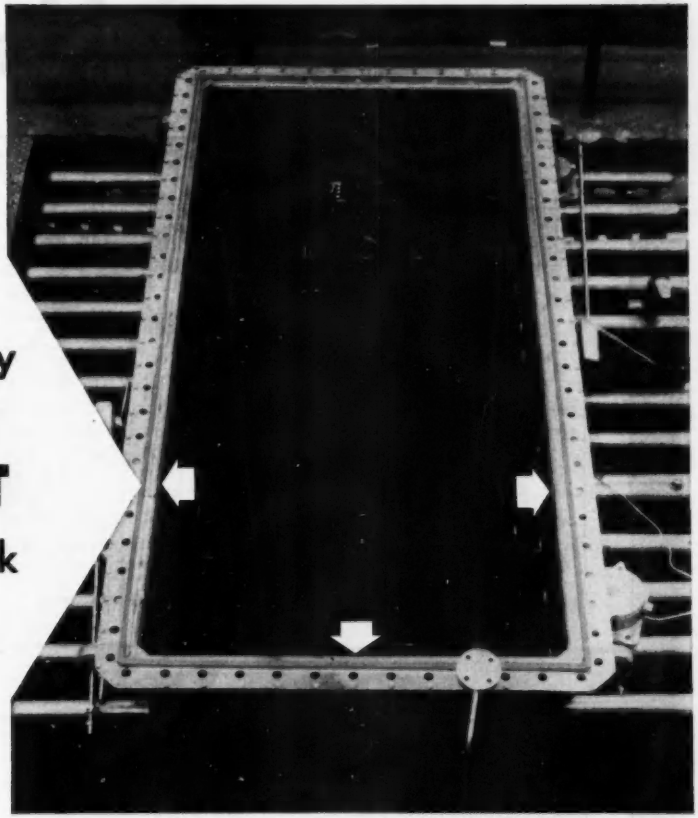
NEW BRITAIN

Automatics

Another development using

B. F. Goodrich Chemical Company ***raw materials***

Revolutionary transformer GASKET does the work of three!



B. F. Goodrich Chemical Company does not make this gasket. We supply the raw materials only.

YOU'D have to search far to find a transformer gasket that does the job as well as the Hycar nitrile rubber one pictured here.

First of all, this gasket effectively resists any deteriorating effects of the hot insulating liquid which circulates in the transformer. Hycar OR-15 is the only elastomeric material that has been approved for this service.

Hycar also seals out moisture and contamination. That's just the start of the savings it makes.

Formerly, on one type of transformer tank, one cork gasket was used for leak testing. It was destroyed when the cover was removed. A second was used in testing the assembled transformer. It, too, was destroyed when the cover was opened for inspection. Finally, a third gasket was used in shipping. (A fourth went along as a spare.)

Hycar nitrile rubber cut these operations. Only *one* Hycar gasket is required for test, shipment and installation. It gives permanency of seal hitherto unknown for this application. Assembly time is reduced from as much as 24 hours to 3 or 4. And there are more advantages.

Hycar was chosen because of its high resistance to cooling liquids, gas, heat, cold, weather and wear. It has excellent compression set characteristics, good aging properties, and low moisture vapor permeability.

Under present conditions, demand for Hycar exceeds supply. However, limited quantities are available for development work. For technical bulletins and advice, write Dept. HD-3, B. F. Goodrich Chemical Company, Rose Building, Cleveland 15, Ohio. Cable address: Goodchemco.

B. F. Goodrich Chemical Company

A Division of The B. F. Goodrich Company

Need high elasticity? Hycar has it—plus extreme temperature resistance and more advantages

Hycar

American Rubber

GEON polyvinyl materials • HYCAR American rubber • GOOD-RITE chemicals and plasticizers

Designing

By D. T. Sicklesteel

Detroit Gear Division, Borg Warner Corp.

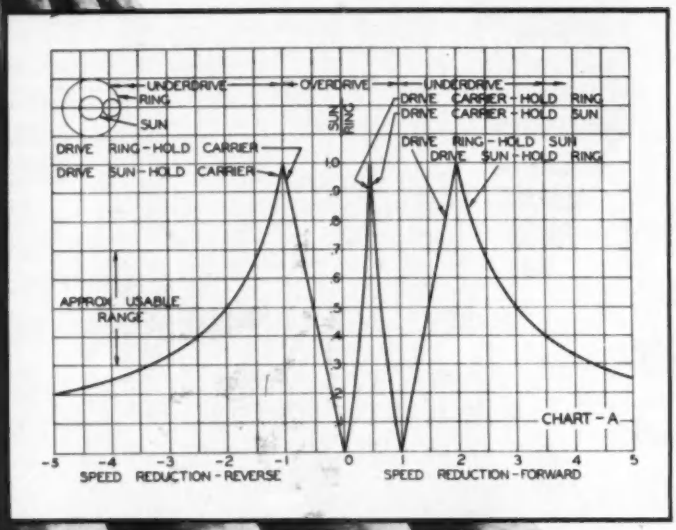


Chart A

Ratios available in a simple planetary gearset.

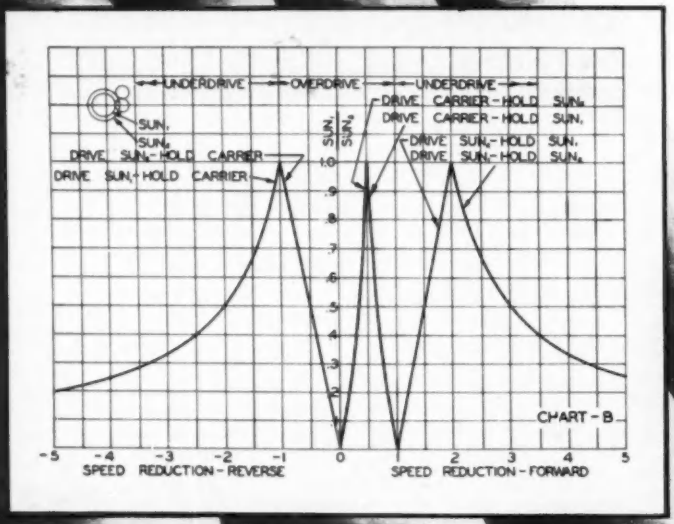


Chart B

Ratios available in a planetary gearset using two sun gears.

Planetary Gears

for Automatic Transmissions

PLANETARY gearing plays a very important part in automatic and semiautomatic transmissions for motor vehicle use. In the passenger car field alone, over 7,000,000 units using planetary gearing have been produced.

The successful application of torque converter type transmissions to commercial and military vehicles indicates very definitely that automatic transmissions will become much more popular in bus, trucks, and tracked vehicles in the near future. In fact, research and development engineering groups already have many such designs on actual test. This, of course, will further the use of planetary gearing even though an auxiliary gear box may be needed to provide adequate overall ratios to give satisfactory performance under most difficult conditions.

Planetary gearing basically consists of a sun gear, ring gear, and planet carrier assembly. Any of the three elements can be the input member, reaction member, or output member of the planetary gear train. This offers the transmission designer flexibility in arriving at desired gear ratios and controls for actuating the input member and anchoring the reaction member to the case. When any two of the members are locked together a straight through drive results as the gear assembly turns as a solid unit.

The design of a planetary gearset for an automobile transmission is based upon vehicle type and weight, engine torque and horsepower, tire size, axle ratio, and torque converter or fluid coupling performance (if used). Before the actual design of the gearset is started the number of speeds, approximate ratios, and the number of automatic shifts should be decided.

The final selection of the type of gearset to be used will be a compromise based on the designer's solutions to some of

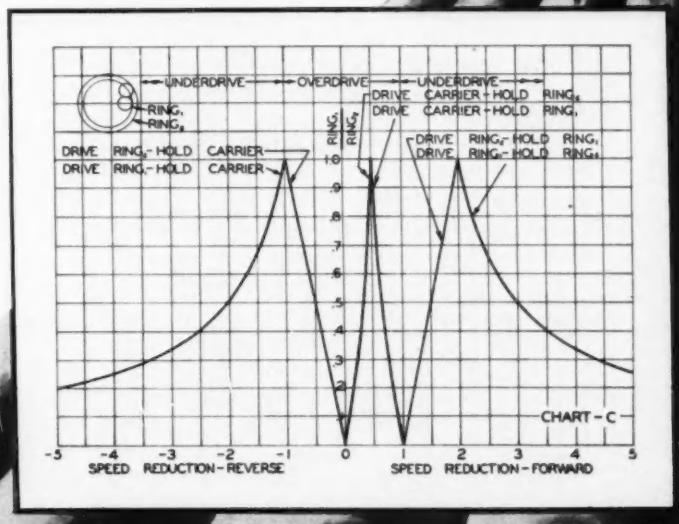


Chart C

Ratios available in a planetary gearset using two ring gears.

the following problems:

1. What kind of shifts—crossover, takeaway, etc.
2. Type and number of clutching and holding elements.
3. Methods for supplying oil to clutches, bands, and lubrication.
4. Provision for adequate support for brake drums.
5. Mainshaft and output shaft size.
6. Practical ratio limitations of various types of planetary gearsets.

Charts A, B, C, and D illustrate the ratio limitations of the simple, double sun gear, double ring gear, and double planet types of planetary gearsets. For example, Chart A shows the ratios theoretically available in a simple planetary gearset having a sun gear, ring gear, planets and a carrier. The ordinate is plotted as the ratio of the sun gear size divided by the ring gear size while the abscissa is plotted as the speed reduction ratio. The driven and held elements are as indicated while the output member is that remaining.

In using this chart it must be remembered that the extreme ratios near the top and bottom of the curves are impossible of attainment because of practical limitations on the size of the sun gear, ring gear, and planets. For example, planets should not be less than 12 teeth because of the difficulty in getting proper tooth action. This places a limitation at the top of the curve in the vicinity of 0.7 sun gear divided by ring gear ratio. Correspondingly, the sun gear cannot be too small because of shaft size and tooth load considerations. This places a limitation at the bottom of the curve in the vicinity of 0.3 sun gear divided by ring gear ratio.

Chart E shows that all of the simple planetary gearsets now in production lie in a well defined band between 0.41 and 0.61 sun gear divided by ring gear ratio. The Studebaker front and rear units and the Hydra-Matic front unit lie on the "Drive Ring-Hold Sun" curve. The Hydra-Matic rear and reverse units lie on the "Drive Sun-Hold Ring" curve. It should be noted that the Hydra-Matic rear and reverse units in reverse gear do not act as simple planetary gearsets but are compounded so that the reverse unit sun gear controls the rotation of the rear unit ring gear to give reverse. For this reason the reverse unit ratio as spotted on the chart is not the true ratio but rather it is shown to illustrate its physical similarity to the other gearsets.

Due to their unique arrangement, the Studebaker front and rear units function differently in reverse than they do in forward.

The Warner Gear overdrive being a speed increasing unit lies on the "Drive Carrier-Hold

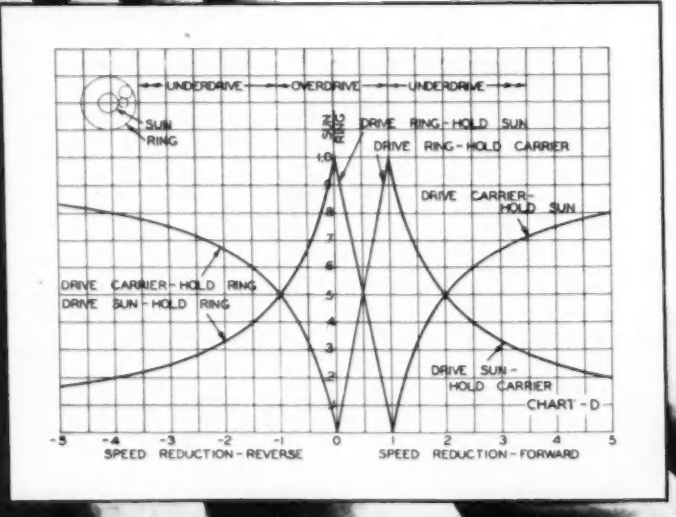


Chart D

Ratios available in a planetary gearset using idler planets.

for Automatic Transmissions

Sun" curve shown in chart below on this page.

The other three charts are self-explanatory. The double sun gear Chart B and double ring gear Chart C provide ratios near 2/1 forward and 1/1 forward and 1/1 reverse that cannot be obtained with a simple planetary set, while the double planet Chart D shows the only type of planetary gearset (outside of those having stepped planets) that provides an exact 2/1 ratio.

Assuming that the type and general arrangement of the gearset have been fixed, we come to the actual calculation of the gears themselves. Much has been written on gear calculations but at the Detroit Gear Division we have adopted a method which we feel is unique. This method has been developed over a period of years and has been used on a variety of marine, aircraft, and automotive applications with good success. It is an attempt to design gears to the service and life expectancy required (similar to anti-friction bearing design). It is based primarily on a method for calculating gear teeth in bending, and bending fatigue curves published by Almen and Straub[1] and compressive stress fatigue data by Buckingham.[2]

The steps are:

1. Estimate full throttle life requirements. For example, for a three-speed automobile transmission we use 140 miles in first gear and 420 miles in second.

2. Using axle ratio and tire size convert miles of life into total number of stress cycles required. For those gears that are used in more than one ratio, the second gear cycles are converted to low gear cycles and added to the low gear cycles required. This calculation is similar to that made for anti-friction bearings operating under a variety of different loads and speeds.

3. Calculate conventional P-V values for each mesh. (Surface compressive stress times rubbing velocity at start and finish of contact.) At this stage of the calculations, P-V values are not found directly. Rather a pitch contact ratio is assumed and the P-V values equated together. This gives a direct solution for the gear outside diameters independent of the face width and results in long and short addendums of the pinion and gear teeth respectively. These long and short addendums tend toward the arcs of approach and recession usually selected for quiet action.

4. The next step is to lay out the gear teeth themselves to determine tooth bending factors and, by increasing the pinion tooth thickness and decreasing the gear tooth thickness, arrive at bending strength values which will satisfy the bending fatigue requirements set up in Step 2. This step is also performed indepen-

(*Turn to page* 59)

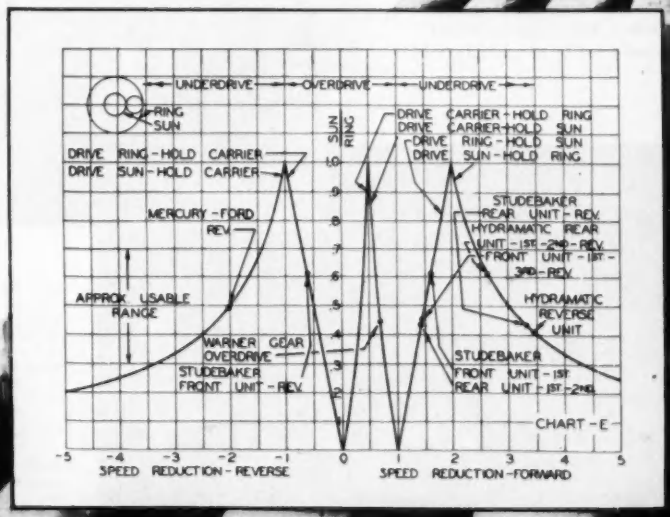

UNDERDRIVE
OVERDRIVE
UNDERDRIVE
RING
SUN
SUN
RING
DRIVE RING - HOLD CARRIER
DRIVE SUN - HOLD CARRIER
DRIVE CARRIER + HOLD RING
DRIVE CARRIER + HOLD SUN
DRIVE RING - HOLD SUN
DRIVE SUN - HOLD RING
MERCURY - FORD REV.
STUDEBAKER REAR UNIT - REV.
HYDRAMATIC REAR UNIT - 1ST - 2ND - REV.
FRONT UNIT - 1ST - 3RD - REV.
APPROX USABLE RANGE
HYDRAMATIC REVERSE UNIT
WARNER GEAR OVERDRIVE
STUDEBAKER FRONT UNIT - REV.
STUDEBAKER FRONT UNIT - 1ST
REAR UNIT - 1ST - 2ND
CHART - E
-5 -4 -3 -2 -1 0 1 2 3 4 5
SPEED REDUCTION - REVERSE
SPEED REDUCTION - FORWARD

Chart E

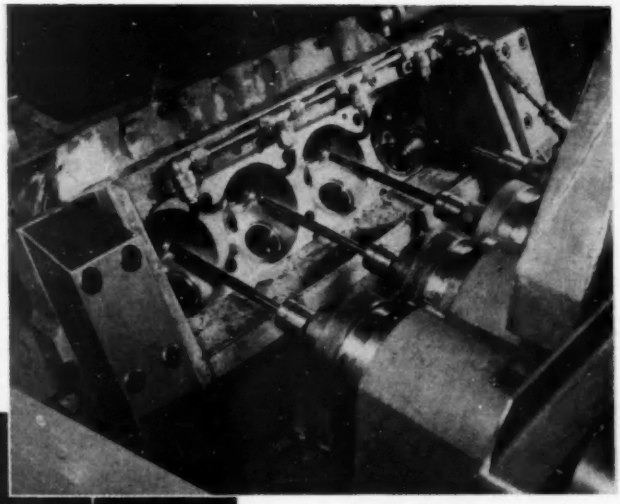
Actual gear ratios of gearsets now in production spotted on Chart A.

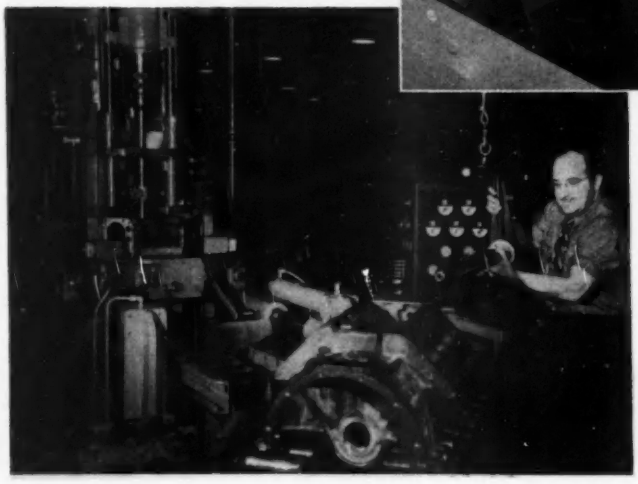
Machining Operations

Chrysler's New V-8

MACHINING of both cylinder block and head for the new Chrysler 180 hp engine employs multiple-station transfer machines of latest types, designed to complete a series of related operations automatically and under fully controlled conditions. These transfer machines represent the most advanced practice known to the art. It is of interest that the cylinder head is so designed as to be interchangeable for both right- and left-hand banks and carries only one part number. Four faces of the cylinder head are finished by surface broaching, taking them two at a time in an enormous three-station, hydraulic horizontal surface broaching machine, similar in basic design to those described in AUTOMOTIVE INDUSTRIES in recent months.

Dictates of durability, improved performance, and improved machinability, have led to the adoption of several special chemical treatments for the cylinder block and the use of one of these on the head casting. Specifically, both cylinder block and head castings are given a Parcoline treatment in the rough before the start of machining. This is said to be most effective





(Above) Close-up on one of the units of the special transfer type precision-boring machine—probably the first of its kind—for finishing intake and exhaust valve seats and valve guide bores. Concentricity of valve seats and guide bores is assured by the use of combination tools.

(Left) The single-spindle vertical honing machine shown in this view handles the honing of the entire main bearing line. A block is seen in vertical position with the long honing tool in place. At the right is the gage for gaging the bores, using one long inspection bar.

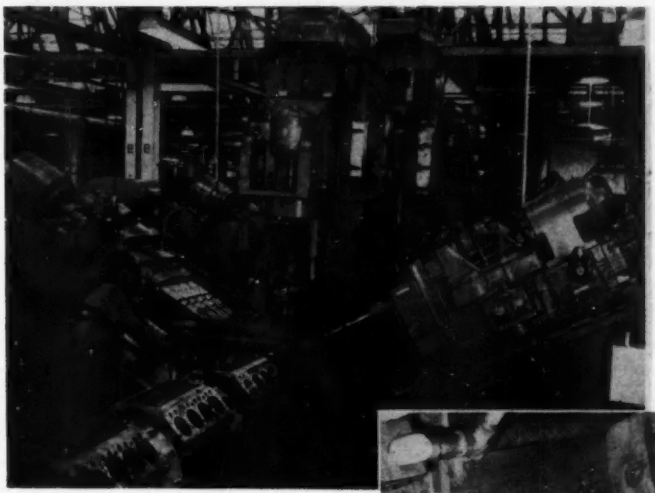
on

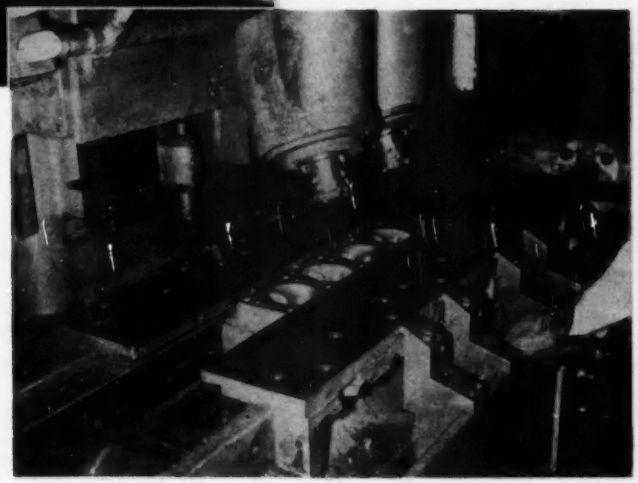
Engine

in removing rust and scale and, at the same time, removing loose sand as well as sand particles trapped within the scale or under scale. Not only does Parcoline improve machinability by presenting clean castings, free from scale and sand to the cutting tools,

WITH the launching of its 180-hp V-8 engine, Chrysler Div., Chrysler Corp., has developed facilities having novelties in production techniques just as outstanding as the design elements of the engine itself. To provide a perspective of what has been accomplished, this article is concerned with a sampling of major operations on the cylinder block and cylinder head. A second article, to be published later, will deal with the methods developed for machining the crankshaft and pistons.

By Joseph Geschelin





(Above) Here is a perspective of the special 11-station transfer machine for drilling cylinder head banks and top cover face. The sequence of operations in this machine is outlined in the text.

(Right) The spherical combustion chambers in cylinder heads are machined by a generating mill having two heads as shown in this close-up. It produces a true spherical contour, holding a tolerance of 0.002 in. on the radius and depth.

Table 1

Station	RH	LH	Vertical Head
		Lead	
1	Drill (14) holes	Drill (14) holes	Core drill (1) hole
2	Drill (15) holes	Drill (15) holes	Drill (1) hole
3	Drill (8) holes	Drill (6) holes	Drill (10) holes
4	Drill (8) holes	Drill (8) holes	
5	Chamfer (1) ream (2) holes	Chamfer (10) ream (2) holes	Chamfer (8) holes and counterbore (1) hole
	Roll block over to clean out chips		
6	Drill (8) holes	Drill (1) hole	Ream (1) dist. hole
7	Counterbore (8) holes	Drill (8) holes	Drill (1) hole
8	Ream (8) holes	Counterbore (8) holes	Drill (1) hole ⅔ of throu
9			Drill & chamfer (4) holgh Drill (1) hole through se
10	Drill (1) angle hole	Ream (8) holes	Ream & chamfer (1) h
11	Check holes for proper depth with electrically controlled gage.ole		

but it also assures clean engines as well as an excellent paint-receptive surface.

Parcoline treatment is handled automatically in a special unit containing a chemical bath which consists of washes, rinses, and a weak solution of phosphoric acid with suitable inhibitors. The chemical bath is held at 180 F.

Later on in the cycle the cylinder block is removed from the machine line and given a full immersion treatment in a Lubrite machine. Although the entire block is given this treatment, the coating is intended primarily for cylinder bores to promote better and safer break-in of pistons and rings and to prolong engine life.

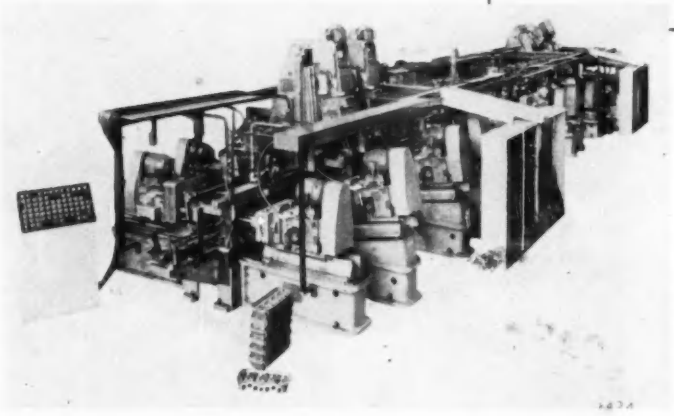
Consider the machining cycle for the V-8 block. First operation on the line is the milling of four locating spots in a duplex milling machine, serving to guide succeeding operations. Initial rough-miling of the oil pan face and rough-milling of bearing cap channels is done in a special vertical mill.

A three-station rotary drilling and reaming machine is employed for drilling and reaming two locating holes and 10 stud holes, and spot-drilling for oil holes. A special drilling and counter boring machine fitted with one horizontal, two angular, and one vertical head takes care of drilling the long oil gallery holes, water drain holes, lower oil pump and distributor shaft holes, and counterboring of welch plug holes.

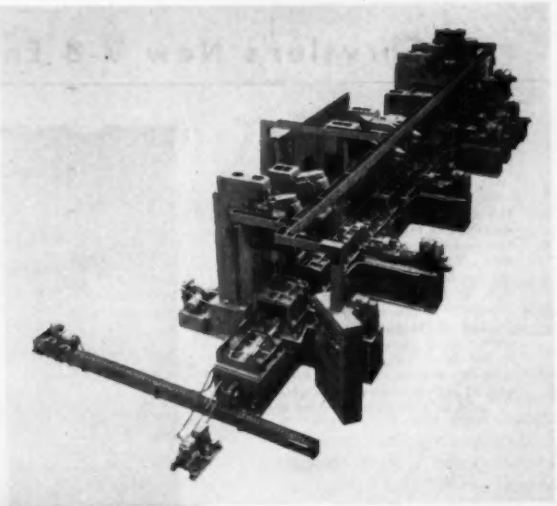
Main bearings are straddle-milled and anchor slots milled in all bearings in a two-station rise-and fall type milling machine, followed by rough-milling of both bends of the block in a duplex

Table 2

Station	Horizontal Head	Angular Head	Vertical Head
1		Lead	
2	Mill filter pad		Drill (21) & ream (1) hole
3	Drill (3) holes		Drill (1) hole
4	Drill (1) hole		Drill (1) ream (1) chamfer 26 holes
5	Drill (3) holes		Drill (5) holes
6		Drill (4) holes	
7	Inspect	Inspect	
8	Drill & chamfer 2 holes	Drill (1) hole	Drill (1) hole
9		Drill (2) holes	
10		Inspect	
11	Drill (1) chamfer 2 holes	Drill (4) holes	
12			Drill (4) holes 2nd half
13	Trepan (2) oil seal grooves		Ream (4) holes
14	Inspect all holes for depth with electrically controlled gage		

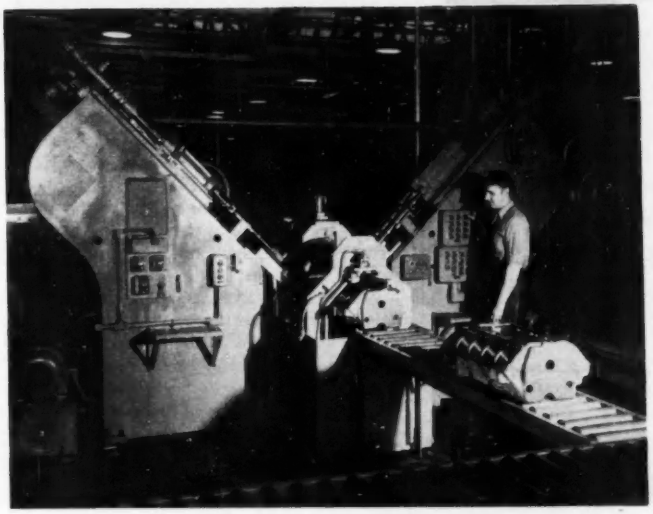


This is the special 10-station transfer machine on the cylinder head as photographed before installation at Chrysler. It performs a total of 46 drilling, 17 boring, seven chamfering, eight reaming, and three tapping operations. As shown in perspective the unit consists of nine hydraulic feed units, and auxiliary heads, transfer and conveyor systems.



(Right) Perspective view of the 14-station transfer machine on the cylinder block which handles drilling, chamfering, trepanning, and milling operations on the cylinder block. It consists of four hydraulic units, 15 air traverse hydraulic feed units, auxiliary heads, transfer and conveyor system. This view taken before the unit was installed at Chrysler.

(Below) Honing of cylinder bores is done in V-type machines of latest type having one hone on each bank. The block is indexed forward to hone each pair of cylinders.



milling machine. Next is the rough-milling of cylinder head angular faces and finish-milling of the top valve tappet cover face in a special mill having two angular columns and one vertical column.

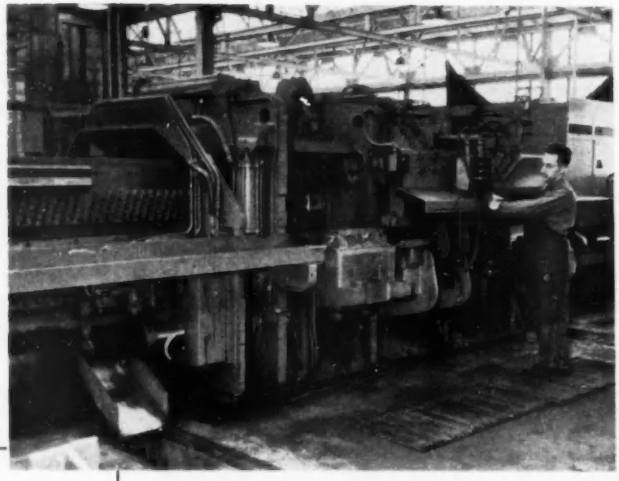
Finishing of cylinder bores is an extensive and painstaking operation. They are rough-bored in an eight-spindle V-type boring machine, then semi-finish-bored in a similar machine, following machining in a 11-station transfer machine to be mentioned later. Then the top and bottom ends of the bores are chamfered simultaneously in one setting in an eight-spindle V-type chamfering machine. Later they are finish-bored in a special eight-spindle V-type boring machine.

This is followed by single-honing in V-type honing machines fitted with automatically sizing hones which are said to provide perfect control of roundness, size, and taper, bores being held for size within a limit of 0.0025 in. These machines have only one spindle for each bank, honing two cylinders at a time, then indexing for succeeding pairs of bores.

Immediately following honing the blocks go to a unique machine designed to swab the bores in preparation for Lubriting, and at the same time pressing-in three Welch plugs on each side of the block. The blocks then proceed through the Lubrite machine, described earlier. To complete the picture of cylinder bore finishing it is necessary to

Table 3

Station	RH Head	LH Head
1	Load	
2	Drill 10 holes	Drill 14 holes
3	Drill 14 holes	Drill 10 holes
4	Idle with fixture for dumping chips	
5	Drill 11, ream 4 holes	Drill 4 holes
6	Chamfer 4, drill 1 hole	Drill 4 holes, comb. ream and counterbore 2
7	Idle	
8	Drill 8 holes	Drill 2 angular holes
9	Chamfer 8 holes	Drill 2 angular holes
10	Unload	



This enormous surface broaching machine, described in the test, is used for finishing four faces of cylinder heads in two operations. The first operation, broaching of the top face and intake manifold side is done at the station at the right of the operator. In the center, immediately to the left of the operator, is the roll-over station which represents the bottom face to the third station to the left of the roll-over. A good view of the huge broach with its individual cemented-carbide tools may be seen at the extreme left.

Table 4

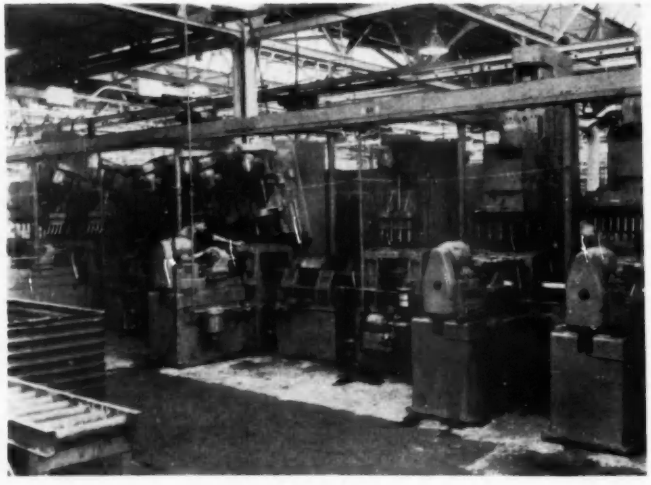
Station	
1	Load.
2	Semi-finish and finish-face exhaust valve seat, bore stem hole in guide
3	Idle.
4	Finish-ream valve stem holes in exhaust valve guides.
5	Tilt work for operations on intake valves.
6	Semi-finish and finish-face intake valve seat, bore stem hole in guide bushing.
7	Idle.
8	Finish-ream valve stem holes in intake valve guides.
9	Unload.

skip many major steps in the process. However, at the very end of the line, after the block has been machined as an assembly, the work enters a special two-way brushing machine fitted with an indexing table. One of its functions is to brush surplus Lubrite coating from the cylinder bores, using special wire brushes for the purpose, leaving a beautiful surface finish slightly etched with Lubrite and free from all amorphous material. At the same time another set of brushes cleans surplus coating from valve tappet holes.

Returning to the machining of the block, the first major operation after rough-boring of cylinders is the drilling of holes in the cylinder head banks and top cover face. This is done in a special 11-station transfer machine having the sequence of operations shown in Table I.

Another of the unusual operations is found on a two-station, four-spindle V-type reaming and burnishing machine for

(*Turn to page* 62, *please*)



Partial view of the 14-station transfer machine for drilling, chamfering, and reaming various holes in the block after Lubriting is seen here. The sequence of operations is given in the text.

Fiber Consumption in Textiles Used for Passenger Car Interiors

DURING 1950 the Bureau of Agricultural Economics undertook a survey of the automobile industry to learn the patterns of use and preference for different fabrics used in the interiors of passenger cars. Information was obtained from Chrysler, Ford, General Motors, Hudson, Kaiser-Frazer, Nash, Packard, and Studebaker. Separate reports on consumption and preferences were obtained from the Lincoln Division of Ford Motor Co. because its purchasing operation was independent of the other divisions of that company.

Quantity and Percentage of Components in Materials Purchased for Convertible Tops for 1950 Convertibles

Material	Pounds
Cotton	1,828,902
Rayon	117,043
Nylon	183
Latex	2,093,708
Total	4,039,836
Estimated number of 1950 convertibles	234,121

The data given in the two tables apply to materials purchased for cars of 1950 model except in the case of one of the smaller companies. The 1950 model of this company had been in production only four months before the change was made to the 1951 models. It was thought that under these circumstances, the materials bought for the 1951 models would be more representative of this company's yearly consumption. Individual companies are not identified in the report which is principally concerned with the industry as a whole.

Estimated Number of 1950 Model Closed Cars Produced—6,648,238

Quantity of Components in Materials Purchased for Upholstery, Sidewall, Headlining, Seat Padding and Foundation Sheeting in 1950 Closed Passenger Models.

Material	Upholstery Pounds	Sidewall Pounds	Headlining Pounds	Seat Padding Pounds	Sheeting Pounds	Totals Pounds
Wool	21,885,986	10,654,760	381,216	294,000	.....	33,215,962
Cotton	4,740,149	9,662,860	12,574,991	166,761,386	3,549,170	197,288,556
Mohair	250,429	64,613	.....	.....	.....	315,042
Nylon	3,890,607	207,081	.....	.....	.....	4,097,688
Rayon	8,008,806	1,852,447	3,993	.....	.....	9,865,246
Vinyl	1,807,985	3,107,056	86,424	.....	.....	5,001,465
Leather	2,703,774	.....	.....	.....	.....	2,703,774
Paper	93,750	.....	.....	.....	.....	93,750
Sisal	.....	.....	.....	22,789,650	.....	22,789,650
Jute	.....	.....	.....	5,998,400	.....	5,998,400
Foam rubber	.....	.....	.....	39,790,014	.....	39,790,014
Hair	.....	.....	.....	225,000	.....	225,000
Total	43,381,486	25,547,817	13,046,624	235,858,450	3,549,170	321,384,547

New Automatic Hidden Arc Welding

AUTOMATIC hidden arc welding has been limited in application to jobs where the joint to be welded is in position for downhand welding. A new process, developed by the Lincoln Electric Co., Cleveland, removes this limitation and extends the advantages of automatic hidden arc welding to jobs where the joint is in positions other than that for downhand welding. With this process the plate being welded may be posi-

(*Turn to page* 55, *please*)

New Helicopter

Powered by Twin Ram Jet Engines

THE Hiller-Hornet, a new, low cost, two-passenger helicopter, is powered by tip-mounted ram jet power plants. A simplified collective pitch stick for vertical ascent and descent is so designed and located as to control the craft directionally through movement in a horizontal plane. Cyclic control for the all-metal blades is obtained by use of an overhead stick and the Hiller "Rotor-Matic" control.

The Hornet will be built in both enclosed cabin and utility models. It will not be available for the civilian market until the defense program permits.

Two-place, twin-engined, ram jet Hiller-Hornet.

(Right) The 11-lb jet unit is quickly detachable after removal of two attachment screws.

(Below) A one-hp lawnmower engine is used to start the Hornet.

Specifications and Performance Data

General Dimensions:	
Rotor blade diameter	23 ft.
Height (to top of rotor)	7 ft.
Weights:	
Utility Model	
Empty	356 lb.
Useful load	544 lb.
Power Plants:	
Number	two
Make	Hiller-designed ram jet engines
Weight (each)	11 lb.
Power developed	31 lbs. net thrust (equivalent to 34 hp)
Performance:	
Normal cruising speed	70 mph
Top speed	80 mph
Range (two passengers)	over 50 miles
Ceiling (full gross load)	12,000 ft.
Rate of climb	1100 fpm

Army Ordnance M-51 military truck now in production at the IHC Fort Wayne Works.

Two New Military Trucks— the M-41 and M-51

Two completely new military trucks, the M-41 and M-51, are now in production at the Fort Wayne Works of the International Harvester Co. for the U. S. Army Ordnance Corps. Model M-41, a 5-ton 6x6 truck, has a wheelbase of 179 in. with a cargo body and will carry a payload of 15,000 lb on the highway or 10,000 lb cross country. The other, Model M-51, with dump body, is also a 5-ton, 6x6, with a wheel base of 167 in. which will carry a payload of 20,000 lb on the highway or 10,000 lb cross country. In addition, they will pull towed loads of 30,000 lb on the highway and 15,000 lb cross country. These vehicles are capable of a maximum speed on the highway of over 50 mph with rated load and cross country towed load and a minimum speed of 2½ mph with smooth running engine. With rated load and cross country towed load, they will negotiate a 2 per cent incline at 30 mph or a maximum incline of 60 per cent at 2½ mph without the cross country towed load.

In addition to these major requirements, the specifications call for many unusual characteristics. One of these is the ability of the vehicle to perform normally in air temperatures ranging from —65 F to 125 F. Special arctic kit equipment provides the necessary accessories for satisfactory operation of the vehicle at extremely low temperatures.

Another important requirement is the ability of the vehicle to ford water. Shallow fording requires all components, including the engine and electrical system, to be waterproofed and equipped for fording hard bottom water crossings to a maximum depth of 30 in. —fresh or salt water—without the use of special kit equipment. Deep fording to a depth of 6½ ft with engine running completely submerged for 15 minutes is accomplished with the addition of two extension pipes provided in a special kit. One, known as the "schnorkel" is for air intake to the engine, and the other, the "snorter," is for exhaust. These are quickly attached and do not interfere with land operations. Fording requirements make it necessary that units such as axles, transmission, transfer case, brake master cylinder, brake booster cylinders, ignition distributor, fuel pump, and gas tank be vented into a manifold system which is connected to the air cleaner. With the incorporation of these devices, the vehicle is ready to ford with only the additional manipulation of a control valve on the instrument panel which shuts off the normal crankcase breather and connects all air intake through the "schnorkel" into the air cleaner. The crankcase becomes pressurized; thus making the engine completely waterproofed.

An unusual type of transfer case, the Timken T-138, provides performance features not found before in a

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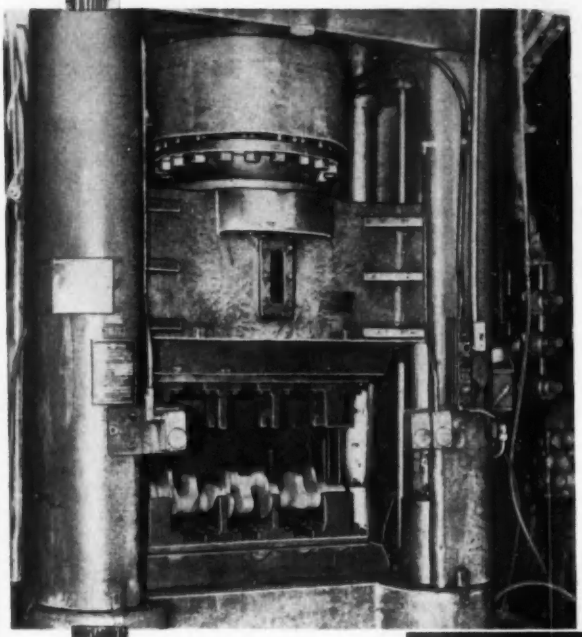
Ausco's

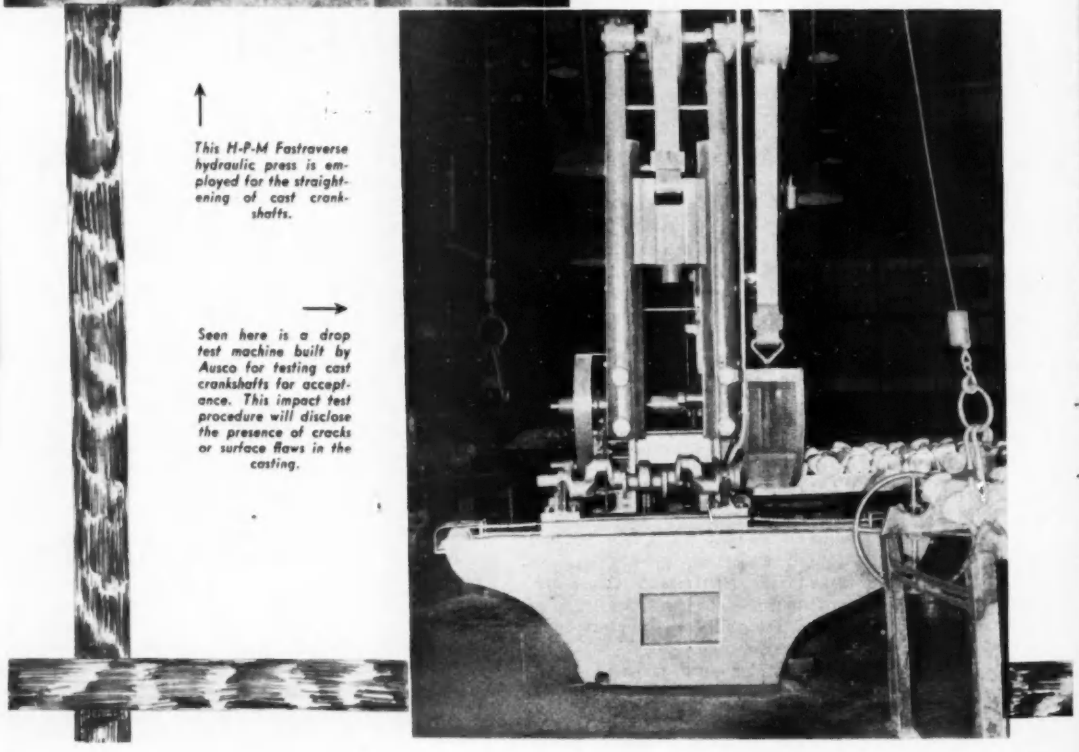


NESTLED in the west Michigan farming community of Hartford, the Hartford Division, Auto Specialties Manufacturing Co., is a self contained plant of real modernity designed specifically to assure adequate facilities for the manufacture of Lambert disk brakes and clutches for tractors and, in the near future, for producing a line of passenger car disk brakes as well.

A windowless structure with some 85,000 sq ft of manufacturing floor

This H-P-M Fastraverse hydraulic press is employed for the straightening of cast crankshafts.

Seen here is a drop test machine built by Ausco for testing cast crankshafts for acceptance. This impact test procedure will disclose the presence of cracks or surface flaws in the casting.



Diversified Production Facilities

By Joseph Geschelin

space, the Hartford plant is designed for precision operations. It is served by a complete air-conditioning system capable of close control of temperature and humidity throughout. The plant area is divided into five zones, each of which can be controlled independently for temperature and humidity. Excellent seeing is afforded by an installation of fluorescent lighting sources providing an intensity of 60 ft-candles at work stations.

Acoustical ceiling treatment throughout the plant assures freedom from distracting noises. In addition, the floors are of hardwood for further increasing worker comfort.

Due to the variety of parts produced here as well as the relative simplicity of mechanical parts design, most of the machine tools are of flexible general purpose type, only a few being of special purpose type. The machinery is arranged in proper sequence, the entire operation being interconnected by a single monorail conveyor running some 2500 ft in length. This conveyor threads all machine shop departments, carries parts into assembly bays, and delivers finished parts to the shipping department.

An interesting feature not only at Hartford but at the St. Joseph plant as well is the use of Ransburg electrostatic paint spray booths. This provides a fast, automatic and economical cycle in which parts are sprayed automatically and dried in an adjoining infrared lamp booth while on the paint conveyor.

At the present time Ausco has in operation plants at Hartford, St. Joseph, Benton Harbor, and Windsor, Ont. The Riverside Division at Benton Harbor is of particular interest to readers of AUTOMOTIVE INDUSTRIES, representing as it does one of the most modern steel foundry operations for producing cast crankshafts for passenger car and commercial engines. It

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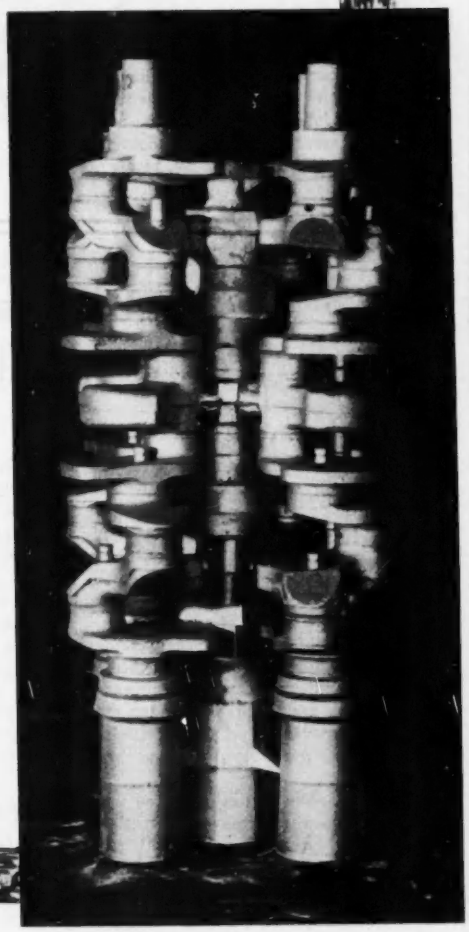

Cast crankshafts are produced at the Benton Harbor foundry four to a mold as shown. This view shows the contents of a single mold directly after shake-out.

Aeroproducts Doubles Size of Plant

A 100 per cent expansion of the facilities of the Aeroproducts Division of General Motors Corp. is now under way. Located on the Dayton Municipal Airport, the present Aeroproducts plant was completed in 1942. The expansion program will double the present manufacturing area, affording a total of over 500,000 sq ft of manufacturing, laboratory testing and office area. A new building will be constructed at the rear and incorporated with the present structure, comprising a complete factory. The entire plant will be air conditioned to maintain the necessary precise tolerances, re-

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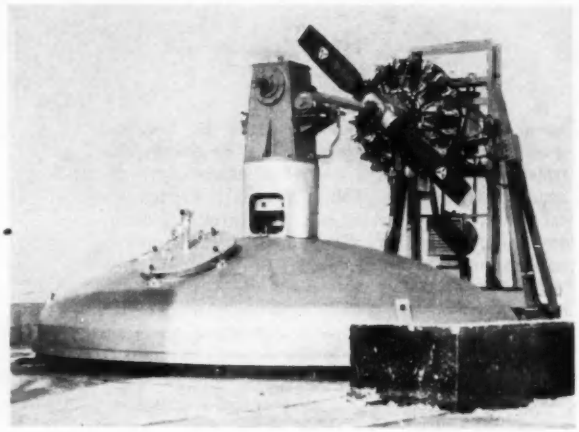
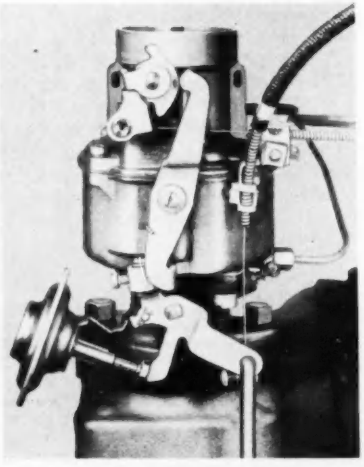


Supersonic propeller "spin pit" which is nearing completion at the Aeroproducts plant.

Throttle Return Check on Powerglide Carburetors

ONE of the unique features of the Rochester Products Div. carburetor when used on Chevrolet Powerglide powerplants is the provision of a throttle return check. It consists of a simple dash-pot mechanism, using a synthetic rubber diaphragm together with a synthetic rubber flapper type valve and a return spring. In operation, as the throttle lever moves toward the closed position, a tang on the lever contacts the adjusting screw of the throttle return check assembly. This has the effect of retarding the last few degrees of throttle travel by closing the valve and bleeding a volume of air through a small orifice within the assembly. As the throttle lever is again advanced, the return spring unseats the valve and rapidly moves the diaphragm, shaft and screw to their original position ready to engage the throttle return check screw.

This mechanism is designed for use with the Powerglide carburetor, and the carburetor throttle body must be equipped with a throttle arm to engage with the throttle return check adusting screw.



This illustration shows the installation of the throttle return check attachment on the RPD carburetor for the Chevrolet Powerglide powerplant.

Five-passenger, four-door Hotchkiss sedan which weighs 2376 lb and has a top speed of 95 mph.

Hotchkiss

Announces All Light-Alloy Car

By W. F. Bradley

Special European Correspondent
for AUTOMOTIVE INDUSTRIES

PARIS, FRANCE

EUROPE'S first all light-alloy automobile is just going into production at the Hotchkiss factory. Built to the designs of J. A. Gregoire, the five-passenger, four-door sedan has a weight of 2376 lb, with a wheelbase of 98 in., a front seat width of 59 in. and a rear seat width of 56 in. Acceleration figures are 47 mph in 12 sec, 60 mph in 18 sec, 71 mph in 28 sec., and 84 mph in 52 sec. Top speed is said to be 95 mph.

The Hotchkiss is built around a full-width bulkhead cast in heat-treated Alpax, weighing 121 lb. and comprising the front wheel arches, the cowl, and the windshield frame. The forward part of this bulkhead receives the engine, clutch and transmission, as well as front suspension horizontal coil springs and support arms. Two Alpax side rails, each weighing 20 lb, are bolted to it at the rear and are united by a square section steel tube cross member. Lighter extensions, added to the main side rails, carry the rear portion of the body.

Engine Specifications

Type	**Horizontal opposed**
Valve location	**In head**
Piston disp.	**134 cu in.**
Comp. ratio	**6.5 to 1**
Maximum hp.	**70 at 4000 rpm**

The engine is a valve-in-head, opposed flat four of 134 cu. in., with light-alloy cylinders having wet liners and light-alloy heads. With a compression ratio of 6.5 to 1, output is 70 hp at 4000 rpm. Clutch and four speed transmission form a unit with the engine. The entire power plant weighs 440 lb.

Drive is to the front wheels with Spicer and Tracta universal joints. The support arms are a combination of light-alloy and steel. Weight of the complete chassis frame assembly, all in light alloy with the exception of the two steel cross members, is 242 lb.

Brake drums are light alloy with iron liners and comprise a spider with five lugs to which the sepa-

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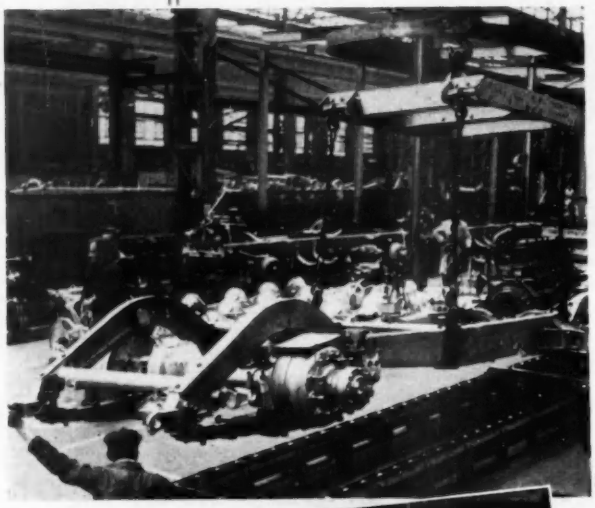
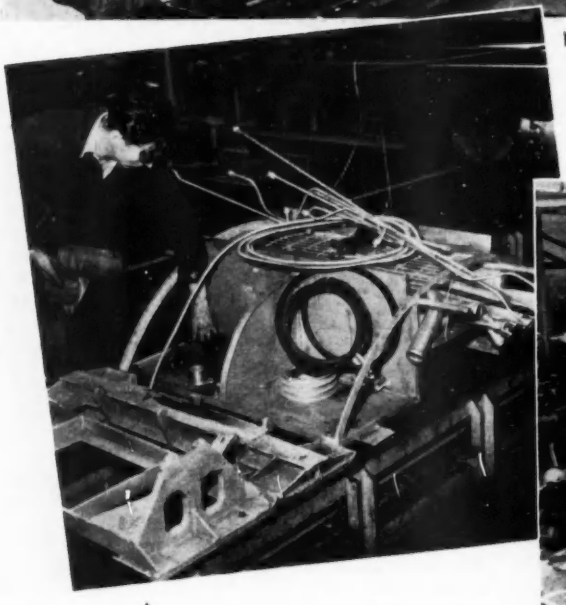
Assembling Large In Modern British

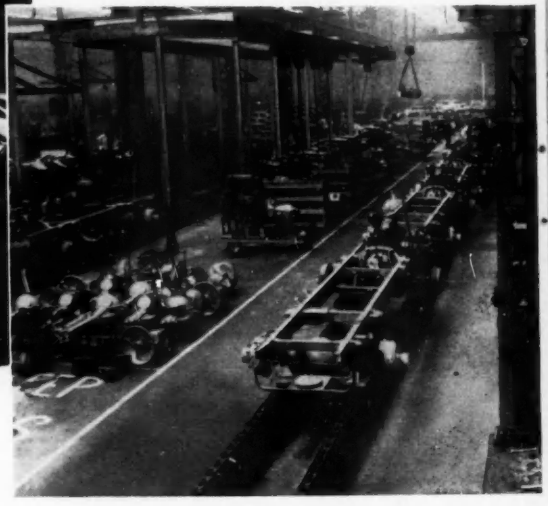


A THREE-SECTIONED conveyor for chassis assembly, nearly 1000 ft long, has been installed by Leyland Motors, Ltd., of Leyland, Lancs., England, for production of truck and bus chassis.

Built to run at a maximum speed of five fpm, it consists of endless chains with eight in. links and three in. diameter rollers. Compressed air lines and electric cables for power tools extend along its length. At one stage it passes through a 20 ft long paint spray booth and a 38 ft



Partly-assembled chassis being transferred from the first to the middle section of the system.

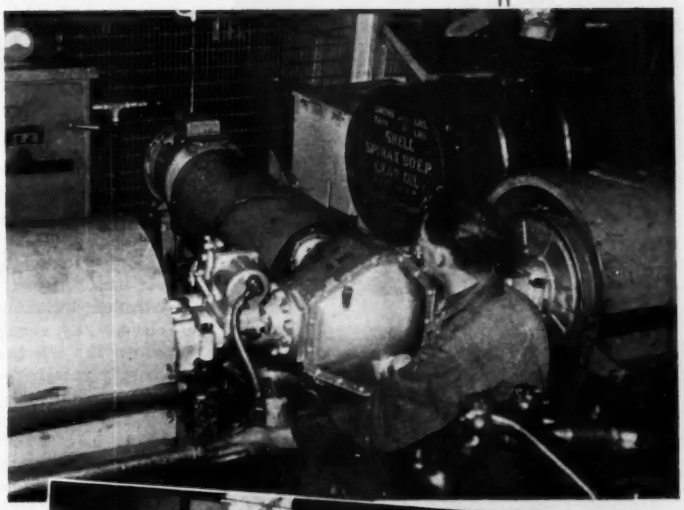


Small parts, in kit form, travel along the conveyor immediately behind each chassis.

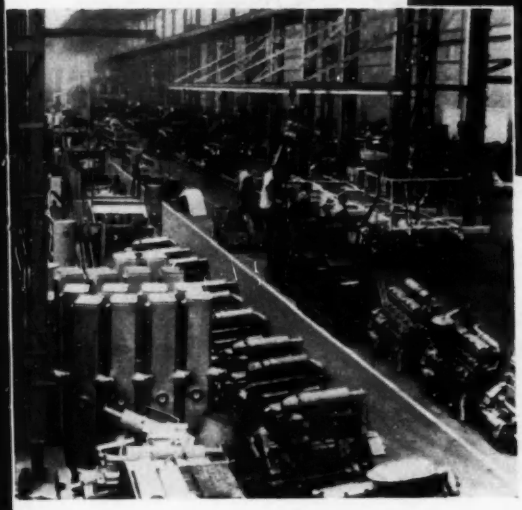
Chassis Plant

long gas - heated drying oven. Components are fed to the line by overhead cranes.

As each finished chassis reaches the end of the assembly line it trips a lever, summons a driver by ringing a bell, and then runs off the conveyor unaided, on its own wheels. Shown here are some selected illustrations of this modern setup.



(Top of page) Rear axle testing machine in a subassembly shop.



Here is a chassis being lowered onto the third section of the conveyor. The paint spray booth is shown in the left background.

General view of the chassis assembly line showing the three conveyor sections.

Two New

This is a view of the Probograph instrument set up in the production experimental department at Ford. The hypoid pinion under test may be seen at the right in the foreground.

THE quality control program of Ford Motor Co., described in AUTOMOTIVE INDUSTRIES, Nov. 1, 1950, is gathering momentum and in its most recent phase marks the introduction of two inspection devices of uncommon importance.

The first of these is an enormous Sheffield inspection machine for gaging and classifying the bores in V-8 engines in a fully automatic cycle. First machine of its kind, it is arranged to gage all eight bores simultaneously, provides eight selections of acceptable bores in steps of 0.00025 in., and stamps the grade on each bore. The machine also provides a ninth selection—for oversize—but does not stamp the size since such bores are not acceptable without further checking and decision as to rejection or salvage.

The machine, as illustrated, is about 5½ ft wide, six ft high, and over eight ft long, weighing approximately six tons. Inspection can be set for cycles of various duration, including 15 seconds at 100 per cent efficiency. By eliminating human error in sizing the bores, the selection of pistons is greatly simplified, thereby reducing assembly time as well as manufacturing cost.

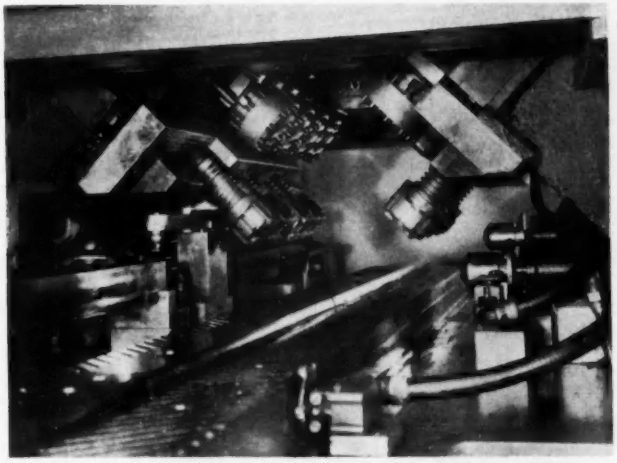
One of the major features of the machine is the large, independently mounted control panel which serves as the master control of machine cycle according to predetermined settings. The gaging and classifying cycle is automatically initiated as the block is placed in loading position. At this point a hydraulic ram carries the block into gaging position against a positive stop, final location of the block being accomplished by means of hydraulically actuated shot pins and clamps.

Eight air spindles are then hydraulically lowered into gaging position. Each spindle is mounted to allow for misalignment, also spring loaded for safety in case of an undersized or improperly located bore. If interference is encountered, the descent of the spindle carriers is stopped automatically, lights (one for each bore) indicating where interference occurs. Without

Ford V-8 cylinder blocks are shown being fed into the new Sheffield automatic gaging and classifying machine for inspecting and marking cylinder bores. First completely automatic machine of its kind, it sizes all eight bores simultaneously, grades and marks in eight steps of 0.00025 in.

Inspection Devices

Automatic Inspection Machine for Cylinder Bores, and Instrument for Precision Checking of Gears and Camshafts, Are Recent Additions to Ford Equipment for Quality Control



Looking into the work station of the Sheffield machine. Here the eight air spindles are shown extended in gaging position (without the block). As mentioned in the text, the block is automatically located and clamped by means of a hydraulic mechanism, this action being initiated as the block is fed to the loading station.

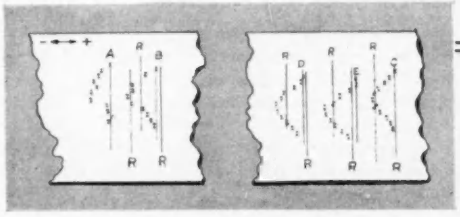
interference, the spindles will enter the bores to a depth of approximately three in. from the top of the engine block, at which time the gaging sequence and selection motor are started.

During the gaging sequence, the air spindles operate in conjunction with Airlectric gaging heads, selector mechanism, stamping device and classification counters.

Measurement of true diameter at one point is simultaneously made in each of the eight bores. The selectors set up and hold the proper classification in the stamping mechanism. If all bores are within tolerance, individual counters for each of eight classifications of 0.00025 in, within the tolerance limits, are actuated in the control panel. These indicate the number of pistons required of each corresponding classification so the proper stock can be built up for assembly. A metal die stamping mechanism then automatically stamps the classification number for each bore on the engine block.

With all bores acceptable, selected, stamped, and classifications counted, automatic retraction is made simultaneously of the spindle carriers, stamping mechanism, locating and stamping devices. This leaves the block free to be pushed out of the machine by the next block.

(*Turn to page 56, please*)



Sample Probograph tape, shown here, indicates the manner in which the instrument records readings. The card was taken on the drive side of a sample hypoid pinion.

Publications AVAILABLE

New Industrial Literature listed in this department is obtainable by subscribers through the Editorial Department of AUTOMOTIVE INDUSTRIES. In making requests please be sure to give the NUMBER of the item concerning the publication desired, your name and address, company connection and title.

A-50 Rotary Straighteners

Mackintosh-Hemphill Co. — Eleven models of rotary straighteners which remove the bends, bows, waves and kinks from tubing or pipe of any metal are illustrated and described in a new four-page catalog just issued.

A-51 Die Cushions

Danly Machine Specialties, Inc.—The availability of a new 20-page booklet on die cushions for mechanical presses has just been announced. The booklet catalogs the company's entire die cushion line with complete size, capacity and dimensional data.

A-52 Blast Cleaning

Pangborn Corp.—Recently released is volume seven, number one of the firm's publication, "Blast Cleaning and Dust Control News." It contains many items of interest to the automotive industries in respect to engine production.

A-53 Diesel Engines

Detroit Diesel Engine Div., GM—A new catalog describes the division's complete line of Series 71 two-cycle Diesel engines for application in the industrial, petroleum and marine fields. The book covers single and multiple engine units from two to 24 cyl with power ranging from 32 continuous to 780 intermittent hp.

A-54 Stud Drivers

Heli-Coil Corp.—A newly announced four-page, two-color bulletin on Aero-Thread stud drivers, published by the firm, covers the uses and operation of both hand and power models. Driving and removing studs of any standard or special thread-form is illustrated with six photographs and seven drawings.

A-55 Die-Casting

Gries Reproducer Corp.—This bulletin contains all the details on Intercast die-casting and its use in commercial, industrial, and scientific applications. Also shown are three special Intercast productions in which two or more elements are cast in one primary operation with explanatory details on the process.

A-56 Adhesives, Coatings, Sealers

Minnesota Mining and Manufacturing Co.—The use of adhesives, coatings and sealers in product design and engineering is described in a new eight-page handbook available from the Adhesives and Coatings Division of the company. The booklet reports the availability of 1000 different basic formulas, and provides technical data on 13 adhesives, seven coatings, and seven sealers.

A-57 Grinders

Gardner Machine Co. — An eight-page, two-color catalog describes and illustrates the new design model 2V-18 double disc precision grinder which was recently announced. Outline drawings and specifications are included in this fully descriptive catalog.

A-58 Rubber Compounds

The Stalwart Rubber Co.—Publication of a new 16-page illustrated five-color catalog intended to familiarize readers with a wide range of Stalwart-developed rubber compounds has been announced. Designated 51SR-1, this booklet lists by code number approxi-

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mately 30 compounds which are representative of more than 500 rubber stocks developed by the company to meet special requirements.

A-59 Aluminum Data Book

Reynolds Metals Co.—A new 194 page publication, "The Aluminum Data Book," has just been issued by the firm to meet the demand for more factual information on aluminum alloys and mill products. Vital facts on aluminum alloys and mill products have been condensed into a handy-pocket-size manual which contains 117 tables of data on physical, chemical, and mechanical properties; standard tolerances, weights standard sizes and production limits; as well as much fabricating data. It will be sent only to those who request it on their company's letterhead.

A-60 Sponge Rubber

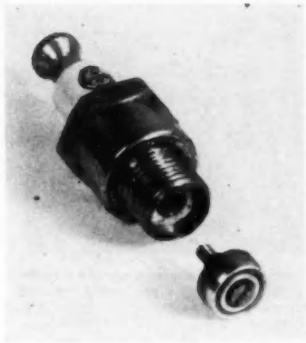
The Sponge Rubber Products Co.—Recently issued by the firm is a 20-page, two-color, well-illustrated catalog dealing with properties and test data concerning cellular rubber.

A-61 Paint

American Chemical Paint Co.—Offered by the company is an article, "Amorphous Phosphate Coatings for Protection of Aluminum Alloys and for Paint Adhesion," that was presented by two members of the firm at a recent technical meeting.

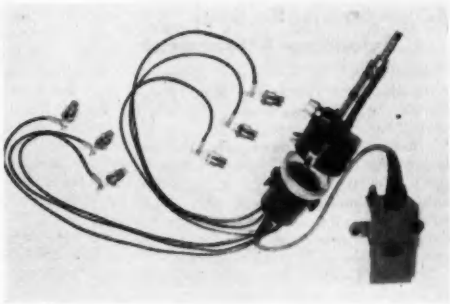
A-62 Instruments in Research, Analysis

Minneapolis-Honeywell Regulator Co.—The acceleration of research through the use of industrial and related instruments and apparatus is the subject of an 8½ in. by 11 in., 84-page book just published by Brown Instruments Div. of the firm. The book describes many types of equipment which, alone or in combination with other apparatus, are being used in research and analytical studies.



Special spark plugs are equipped with detachable sparking element.

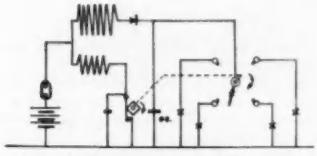
Low Tension Ignition System



Complete low tension equipment for six-cylinder engine.

A LOW-TENSION ignition system which operates with a secondary voltage below 3000 volts has been developed in Holland. As shown in the electrical diagram, it employs a condenser in the secondary circuit and a rectifier between the coil and condenser. In addition to the arrangement illustrated, a special low tension magneto can be used to charge the condenser.

Timing is controlled by the distributor instead of by the contact breaker mechanism. Current from the charged condenser is carried by the rotor to fixed contacts in the distributor housing, each contact being connected to a spark plug. Because of its low tension, the current will flow only when direct contact is made between the rotor and fixed contacts.



Schematic diagram of the Smits low tension ignition system.

Special spark plugs with ring-type electrodes are used with the new ignition system. They are designed as cold as possible in order to assure the formation of deposits on the sparking surface to reduce electrode wear and to strengthen the spark. Because of its unusual characteristics, the system is said to perform better when resistance between spark plug electrodes is less than 10^5 ohm.

Spark plug gaps are less than 0.012 in. The sparking element is a separate unit for easy replacements as shown in the illustration. It is claimed that compression ratio, temperature and fuel characteristics have practically no effect on efficiency of the plugs which are of a universal type for use in any type of engine.

Adapter sets have been designed with which it will be possible to adapt existing high-tension sets for low tension with only minor changes in the installation. This new low-tension ignition system was developed by Smitsvonk N.V., Rijswijk, Holland.

NEW EQUIPMENT • PRODUCTION •

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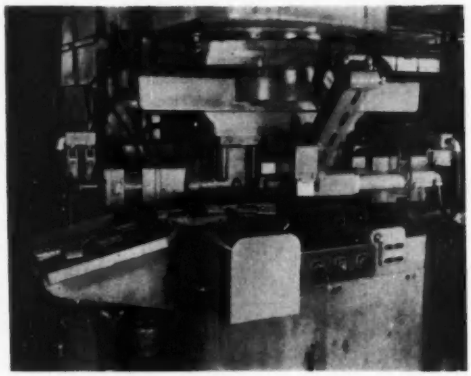


Michigan Tool automatic gear unloading attachment

B-29—Automatic Gear Unloading Attachment

A universal, self-contained, automatic unloading attachment for rotary gear shaving machines, introduced by Michigan Tool Co., Detroit, Mich., supplies the need for a standard unit available at low cost to convert shaving machines for automatic unloading. It is adaptable to unloading of small gears when automatic loading is employed, reducing operator fatigue and permitting one operator to service more machines.

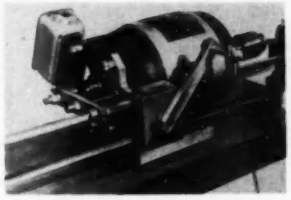
A typical application of the unloader is illustrated, with guards removed. The unloader consists of a small wire-mesh belt which travels over two drums. Drive is from a low-horsepower electric motor; slots in one mounting bracket allow adjustment to take up slack in the belt.

Advantages cited for use of the wire-mesh belt consist in its permitting cutting fluids to drain back into the machine before the gear is discharged into the collection pan, since the belt moves at a relatively low constant speed. Also, the "give" of the belt prevents damage to finished gears either from striking a conventional metal chute or another gear—metal in the belt being softer than the gears. And finally, there is a long life expectancy for the belt, with freedom from damage from cutting fluid.

The unloader can be attached to any Michigan Tool Co. 870 or 870A automatic gear finisher in any of several positions. No changes in the machine are necessary except to drill and tap a few holes for mounting brackets and the discharge chute.

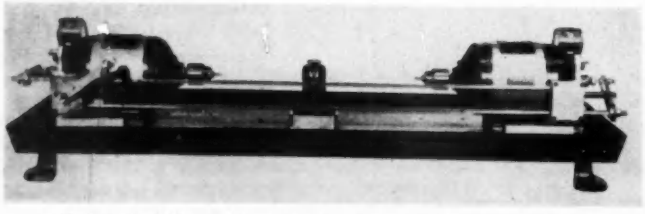
B-30—Countersinking and Deburring Machine

Latest model high-production countersinking and deburring machine, manufactured by Black Drill Co., Cleveland, Ohio, is now equipped with a new positive-type tool actuating mechanism for precision operation on a wide variety of work up to the full 20 in. capacity of the machine. The new control is a double rack and pinion traversing mechanism operated by a foot treadle. Each rack carries an arm fitted with a micrometer adjusting stud which transmits pressure to the motor shafts. These arms are quickly adjustable by set screws to any rack position, while an adjustable stop on the lower rack definitely limits the travel of both motor shafts.



Close-up of motor shows operating cable to foot treadle, rack and enclosed pinion traversing mechanism. It also shows the micrometer adjusting stud controlling motor shaft movement and cutting depth

In operation, when power is supplied to the two traversing shaft motors, the rotors automatically position themselves in the center of the magnetic fields in the stators and remain there. When the work is in place, pressure on the foot treadle is transmitted through a cable, arm and pinion to produce an opposite directional movement of the racks. These racks, through attached adjustable control arms, bring equal pressure to bear at the ends of the motor shafts, causing them to move in the stators and thus advance the tools into the work simultaneously.



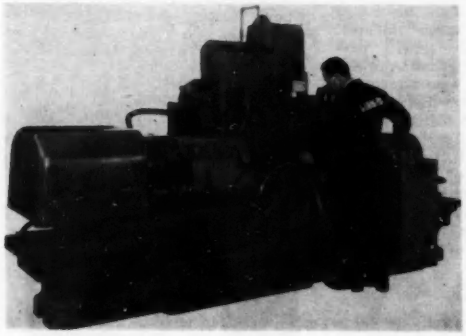
Black countersinking machine, rear view, motors moved apart for long work

B-31—Crank Pin Grinding Machine

Available from the Landis Tool Co., Waynesboro, Pa., is an improved Type DH crank pin grinding machine furnished in swings of 16 in. or 25 in. and in lengths to accommodate 32 in., 42 in. and 72 in. crankshafts. The machine is used extensively in the automotive industry for high production grinding of the crank pins of 4, 6 or 8 cylinder crankshafts. It is also used in the farm machinery and aviation industries for high precision grinding of crankpins.

Lubrication to the carriage and wheelbase ways is from a separate reservoir with pump and filter. A

items, please use coupon on PAGE 46



Landis crank pin grinding machine, Type DH

safety pressure switch prevents operation of the machine unless pressure exists in the system. If the pressure should fail, the machine motors will stop. The carriage ways are fully protected from dirt by telescoping covers which keep the hand scraped ways protected regardless of the carriage position.

A new sensitive hand feed for the carriage is used for positioning the crankshaft laterally as the grinding wheel moves toward the work, permitting even grinding on each side of the crankshaft sidewall. Oil reservoir is fully enclosed. Quick filling and emptying is provided.

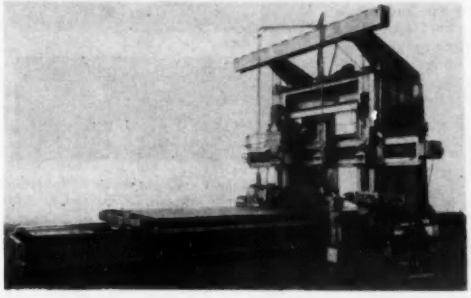
Speeds of the hydraulic traverse are adjustable at the front of the machine. There are separate controls for positioning speed of the carriage and for both right hand and left hand cushioning speeds.

The Microsphere spindle bearings are lubricated by pressure. A separate reservoir for bearing lubricant is built into the wheelbase. This system is protected by use of a pressure switch which prevents rotation of the spindle unless oil pressure exists in the bearings. If pressure should fail, the wheel drive motor will stop rotation.

An overhead type wheel dresser may be obtained to speed the operating cycle. This dresser is hydraulically operated and permits dressing the wheel without changing the work set-up. A compensating wheel feed for resetting the wheelbase to the correct position after dressing with the overhead dresser may be had as extra equipment.

A variable speed motor to maintain correct surface speed of the wheel regardless of wheel diameter is available. Automatic sizing is optional equipment.

B-32—Combination Planer And Miller



Gidding & Lewis Hypro combination planer and miller having three planing heads and two milling heads

Handling work up to 10½ ft wide, 9 ft high and 26 ft long, a new Cincinnati combination planer and miller announced by the Giddings & Lewis Machine Tool Co., Fond du Lac, Wis., is designed to simplify setup and machining of huge parts and assemblies.

To increase the flexibility of this Hypro combination machine, a right and left hand planer head is mounted on the rail. These may be operated individually or simultaneously. In addition a right hand planer side head is used to give the machine conventional planer advantages. The rail heads may be traversed to clear the entire table for a vertical milling head also mounted on the rail. Similar to the planer heads, the milling head may be swiveled to reach angular surfaces on the part being machined. A left hand milling side head is provided to augment the regular machine functions. This head also swivels and is capable of reaching surfaces on the side of the workpiece.

Both milling heads are designed for heavy duty service. They have a 10 in. quill and are individually powered with 25/50 hp two speed motors. Each milling head has eight mechanical gear changes and with the two motor speeds mentioned provides 16 spindle speeds.

Drive for feed and traverse to the table for milling operations furnishes electronic feed to the table in infinitely variable increments from 1 to 60 ipm.

A similar milling drive is mounted on top of the arch which supplies milling feeds to the milling head saddles of 1 to 40 in. per minute in infinitely fine increments. The electronic feed is also available to the cross rail in an up and down direction at a rate of approximately ¼ to 10 in. per minute. This rate of feed readily permits the use of a right angle milling attachment with a standard milling head, thus enabling the machine operator to reach offset or irregular surfaces on the workpiece without disturbing the part setup. On the left side of the machine is mounted a 75/125 hp planer drive which supplies planer speeds to the table from 6.7 to 200 ft per minute.

B-33—Line of Metal Squaring Shears

To offer sheet metal fabricators a better size range in squaring shears rated at 12 gage mild steel, and 16 gage stainless steel, Wysong and Miles Co., Greensboro, N. C., now builds 12 gage shears in 52 in., 6 ft, 8 ft, and 10 ft cutting lengths. To insure top performance at the 12 gage rating, Wysong tests each shear on 10 gage sheets. In the test, cutting is full length at 60 strokes per min. Bed, end-frames, holddown and knife-bar are one-piece, Hi-tensile, castings, containing more

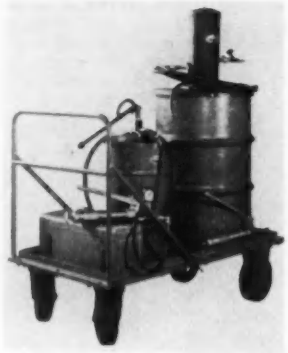
(*Turn to page 54, please*)

NEW PRODUCTS

For additional information regarding any of these items, please use coupon on page 46

C-58—Portable Lubrication Device

A LubriKit for the reloading of individual bearings and centralized lubricating systems on machinery in industrial plants, has been designed and built by the J. N. Fauver Co., Inc., Detroit, Mich. It consists of an electrically-operated barrel pump mounted on a 400-lb grease drum for the filling of grease reservoirs; a hand transfer pump on a 100-lb drum for the delivery of oil; and a tool box containing hand tools, miscellaneous fittings and hand guns for the servicing of individual bearings. Hose, nozzles and gages are included, all mounted on a steel base 30 in. by 60 in., having 10-in. diam rubber casters, two solid and two swivel, for easy maneuvering through factory aisles.



Fauver LubriKit for reloading bearings and grease reservoirs

C-59—Powered Hand Tool

Introduced for heavy production work by Chicago Wheel & Mfg. Co., Chicago, Ill., a powered hand tool, called the Hi-Power grinder, is designed for constant duty without slowdown. For use in industrial plants, pattern shops, foundries, and die shops, the new hand grinder is claimed to have power, speed, and stamina for delicate die jobs as well as for hogging off substantial amounts of stock. Operating at 20,000 rpm, the tool maintains the speed needed for tough grinding jobs. Vibrationless performance is assured through full dynamic and static balance.

The motor is independently mounted and easily detached from its hand piece. Construction provides an independent ball bearing spindle, lubricated for life, and a forced-air ventilated hand piece. The tool has a universal Jacobs chuck with ¼ in. capacity, permitting use of a 2 in. grinding wheel or any ¼ in. or ⅛ in. shank mounted wheels. Sanding drums, wire brushes, felt and soft rubber polishing wheels may be attached. Measuring 11 in. over-all length, the unit weighs 5 lbs 10 oz.

Equipped with eight accessories, including mounted wheels, sander, chuck key and dressing stone, the Hi-Power grinder comes in either of two models—No. 3500—110-120 V AC-DC, 25-60 cycle and No. 3505—220 V AC-DC, 25-60 cycle.

Chicago Wheel & Mfg. Co. Hi-Power grinder

C-60—Self-Centering Drill Chuck

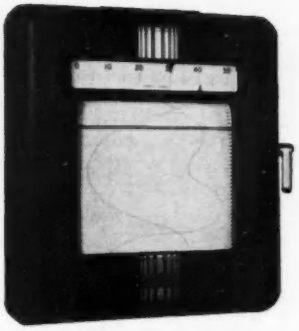
An automatic self-centering Swedish steel drill chuck, the Gronkvist, distributed by Eric S. Johnson Co., is now available to American manufacturers.

Operation features safety and simplicity. No keys, collets or wrenches are needed to release the drill from the chuck—just a twist of the grip of the chuck and the rollers expand, releasing the hold. Insertion of a new drill and release of grip are all done while the machine is running. The chuck centers the drill automatically and with increased speed and pressure the grip of the chuck tightens. All drill slip is eliminated. No interlocking parts chew up drills. Capacity of the chucks range from 1/32 to ¾ inches. There are five sizes of chucks for the above ranges. Chucks are available with shanks of No. 1, 2, 3 or 4 Morse taper, for light and heavy production drilling.

The Gronkvist, self-centering drill chuck distributed by Eric S. Johnson Co.

C-61—Two-Pen Electronic Recorder

Saving tedious compilation and point-by-point plotting of data, the new 2-pen Speedomax, electronic recorder announced by Leeds & Northrup Co., Phila., Pa., records two functions simultaneously against time. Since both functions are drawn as continuous curves on a 9⅞ in. wide chart, users can follow swift-changing variables with ease.



Leeds & Northrup 2-pen Speedomax recorder.

Two separate electronically-amplified measuring circuits, two balancing motors, and two recording pens are all housed in one standard Speedomax case. Circuits can be supplied to work with thermocouples, Thermohms, strain gages, tachometers, thermal converters, pH cells, or most other types of primary elements. The instrument can operate controls or alarms.

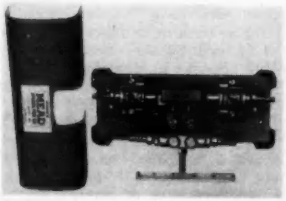
Recording pens operate overlapping or side-by-side, either across full scale or a specified portion of the full width. Speed of response for full-scale pen movement is 3, 2 or 1 second.

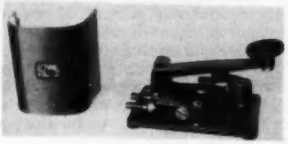
(The above item appeared on page 84 of the February 15th issue, with incorrect cut. It is here republished in full, with correct cut.—Ed.)

C-62—Pneumatic Timing Devices

New simple pneumatic timing devices now placed on the market by Mead Specialties Co., Chicago, Ill., eliminate watchful waiting by the operator of a working machine such as a drill press. He merely starts the cycle, and the

timer stops it. Thus a second machine, or battery of machines, can be loaded while the first is working. If applied to a battery of drill presses, each drill must reach the bottom of its hole before the timer will stop the cycle. There is no waiting time. Result is increased production and reduced operator fatigue due otherwise to involuntary nervous strain of watching for the end of each cycle.





Meadmatic Timer, Model 4

Meadmatic Timer, Model 5

Model 4 Meadmatic timer, illustrated, might be called a remote reverse valve. With it, an FC-1 limit valve can be placed at the end of the traverse of a working machine so that it will be tripped by the forward motion of the machine. This causes the timer to shut off the air from the forward-moving air cylinder and admit air to propel the return motion. Or, in the case of single-acting cylinders, it can permit the return spring to actuate the return motion.

Model 4 timer, as distinguished from Model 5, operates both double-acting and single acting cylinders. It can also be set up for a continuous cycle by placing an FC-1 limit valve at the beginning of the stroke as well as at the end of the stroke of a working machine.

C-63—Fresh-Air Truck Cab Heater

Put out by Reo Motors, Inc., Lansing, Mich., is a fresh-air heater for Reo trucks affording summer comfort in the truck cab when weather outside is zero. Objectionable odors, tobacco smoke, and stale air are constantly forced out by incoming fresh air. Additionally, cab interior pressure being higher than outside pressure, drafts at windows and doors are checked. Large twin defrost nozzles evenly distribute heated air over the entire windshield. Full blower blast affords fast de-icing of sleet or snow. An abundance of warm air is also directed to the driver's feet.

By contrast, in summer during rainy weather, outside air may be circulated to keep the cab comfortable and prevent windshield fogging. The heater affords a complete change of air every minute.

Installation of Reo fresh-air heater

C-64—Materials Handling Equipment

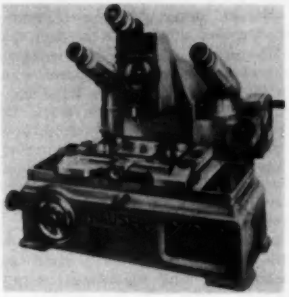
Illustrated is a new light-duty towing tractor to be exhibited at the 4th National Materials Handling Exposition in Chicago, by Clark Equipment Co., Battle Creek, Mich. Clark will also exhibit new powered hand pallet trucks—the Hydro-Lift which is gasoline-powered with hydraulic-motor drive, and the Electro-Lift having electric power and electric motor drive. The Hydro-Lift and Electro-Lift feature the motor mounted in the drive wheel. Additionally, a redesigned electric Clipper fork-lift truck will be shown.

Clark new light duty towing tractor

Special fork-truck attachments and devices, hydraulically or mechanically operated, will be displayed, some of which are designed to eliminate the use of pallets in various handling operations.

A number of the gasoline-powered models to be shown in Chicago will be offered for the first time with the Clark-exclusive Dynatork Drive. This drive operates by means of magnetic induction, employing in lieu of a clutch and a conventional transmission, a constant-mesh forward and reverse gearing. The magnetic induction driving force is applied through an air gap, thus eliminating rough, jerky flow of power from engine to drive axle, and metal-to-metal contact.

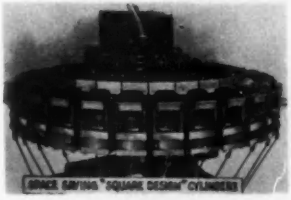
C-65—Precision Measuring Machine



A measuring machine for precision measurements with direct optical reading to 0.00005 in. without the use of micrometer-screws, available from Hauser Machine Tool Corp., Manhasset, N. Y., direct and exclusive U. S. Factory Representative of Henri Hauser, Ltd., Bienne, Switzerland. Universal application, simple handling, and direct optical reading of measurements in graduations of 1 in., 0.1 in., 0.01 in., 0.001 in., 0.0001 in. and 0.00005 in. characterize this measuring machine, designated Hauser Type P234

C-66—Square-Design Cylinders

Designed by Hautau Engineering Co. of Detroit, Mich., for volume production of automotive transmission brake bands, a new special, 30-station "Cycle-welding" machine is said to owe its economical compactness largely to the use of space-saving "square-design" cylinders developed by Miller Motor Co., Chicago. The design of the machine makes maximum use of standard parts for easy replacement. Each of the 30 stations is, in effect, an independent press with its own, easily replaceable standard thermostatic controls, electrical connections, and Miller "square-design" cylinder.



Miller square-design cylinders used in 30-station cyclewelding machine for manufacture of transmission brake bands

The space saved by the square-design cylinders over conventional type circular bolted designed cylinders permitted the 30 stations of the machine to be designed and built into an unusually compact 9½ ft diam circular table, allowing convenient accessibility to center slip rings and air headers from a standing position. Conventional type

NEW PRODUCTS

For additional information regarding any of these items, please use coupon on page 46

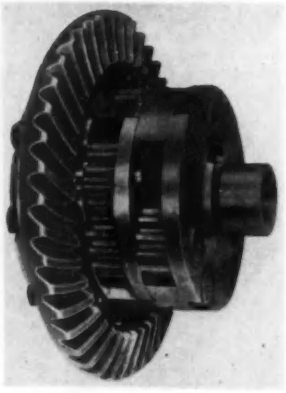
circular "bolted" designed cylinders of the same bore would have required an 18 ft diam table, making the machine much more expensive to build, more costly and difficult to service, and occupying over three times the floor space.

The new machine is an example of automation, whereby one operator loads the rings and liners, then trips the expander valve lever. The work table rotates at variable speeds from 3 to 6 minutes per revolution depending upon "cure" time required. Cyclewelding operation requires about 450F temperatures and 200 to 450 psi lining area pressures.

In addition to their space-saving feature, the cylinders have solid steel heads, caps and mountings, scratch-resistant, hard chrome plated piston rods, dirt wiper seals, rustproof precision-honed brass barrels, and self-regulating, wear-compensating seals that are non-adjustable and tamper-proof.

C-67—Power-Dividing Differential

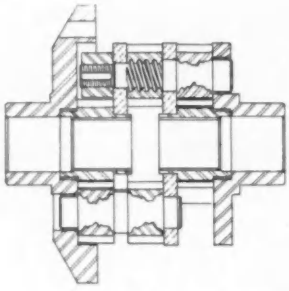
The Dualoc Drive, Inc., Rockford, Ill., are now making plans to market their new improved power-dividing differential for automobiles, trucks and farm equipment. Function of the new Dualoc power-dividing differential is to distribute the torque between the wheels, giving the wheel with the greater amount of traction the greater



Dualoc power-dividing differential

amount of torque, whereas the conventional differential attempts to force each wheel to take approximately half of the power output. Under adverse driving conditions the Dualoc differential is said to control torque to the extent that slippage, due to uneven road surfaces, sand, gravel, snow, ice or slippery mud is minimized, and stalling is practically eliminated.

The unit is entirely automatic in action. Its outstanding control of torque

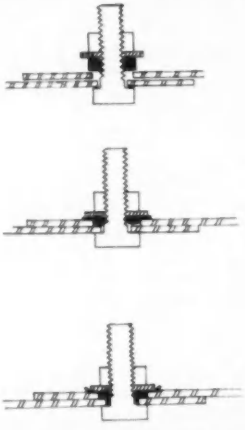


Longitudinal sectional view of Dualoc power-dividing differential

tends to prevent skidding. Dynamometer tests of the Dualoc differential show a power dividing ratio of 14 to 1. Comparatively simple design of the unit is said to lend it to mass production at reasonable cost.

C-68—Sealer Washer of Fabricated Compound

A washer that seals out air, dust, water and water vapor, produced by the Presstite Engineering Co., St. Louis, Mo., is a fabricated compound developed by Presstite for the automobile and other industries confronted with the problem of sealing bolts,



Presstite 169 compound sealer washer, showing three steps in installation

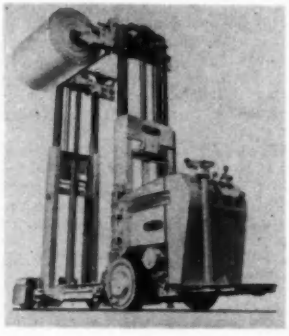
screws and other similar parts. Its strong adherence to faying surfaces is said to have proven effective in eliminating squeaks and rattles.

The washer is made in standard sizes, inner dimension permitting it to be slipped freely over a shaft, bolt or screw. As the bolt or screw is tightened, the sealer is forced into the annular space between the bolt and the rim of the hole, effecting a water-tight seal. Only a minimum amount of pressure is required to cause the sealer to flow into voids and openings to be sealed.

For ease in handling and to prevent them from sticking together, the sealing washers are furnished with a light tissue paper on the face. Under the pressure of the assembly, the compound flows through the paper, saturating it.

Special washers can be supplied from materials that are resistant to gasoline, oil and other properties.

C-69—Specialized Roll-Handling Truck



Lewis-Shepard specialized roll-handling truck

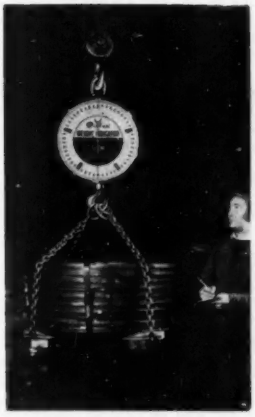
A highly special piece of materials handling equipment built by Lewis-Shepard Products, Inc., Watertown, Mass., handles 1500-lb rolls, 32 in. in diam. and 42 in. long, in and out of 5-high storage racks along both sides of 54 in. wide aisles. The truck services one room holding 1200 of these valuable rolls and operates in complete darkness. A signal system built into the truck lets the operator know the aisle and his position in the aisle as the truck moves along. Due to limited clearances in handling the rolls in and out of the racks, even the deflection and wear of the rubber tired wheels on the

truck had to be overcome. This was done by four hydraulically operated positioning pads on the truck which not only prevent movement to the truck horizontally (while handling the roll in and out of the racks) but also positions the truck vertically so that rolls could be handled within close tolerances.

While travelling in the aisles between columns of rolls in racks, the truck is steered by guide rollers running against the side of the aisle tracks. In all other places the truck is steered manually. Electric storage battery power moves the truck and runs the hydraulic pumps which control all other motions. These many varied motions are hydraulically interlocked to minimize human error which might result in damage to rolls or truck. Hydraulic control was selected to eliminate resulting short circuits which might occur if truck motions were performed electrically.

Once the truck reaches its position in the aisle, a few controls are set and the carriage automatically starts to raise to the proper level, move sideways, pick up or deposit a roll, return to the center position where the carriage lowers to a normal position.

C-70—Redesigned Weight Indicator



Dillon weight indicator

Redesigned weight indicator, product of W. C. Dillon & Co., Inc., Chicago, Ill., provides a dial diameter increased to 16 in. to afford closer readings. Pivots and bearings are of highly polished, hardened tool steel. Full compensation for tare loads has been provided, and a 360 deg ball-bearing swivel hook is now standard. Accuracy is to within one division of the standard reading at any point on the dial. The weight indicator weighs steel, wire, lumber, cement, aluminum foil, scrap, drums, crates, poles, reels, machinery and hundreds of other items. It is declared especially advantageous where long or bulky objects cannot be easily moved to a central weighing point.

C-71—Motor Starter For Machines

Protection of operating personnel as well as the connected machine is stressed in a new motor starter—the Motor Watchman, Class 10-100-SI—available from Westinghouse Electric Corp., Pittsburgh, Pa.

Westinghouse motor starter, the Motor Watchman, class 10-100-S1

With ratings up to 600-v, 7½ hp polyphase, 5 hp single phase; or 220-v, 1½ hp dc, it starts, stops, and provides overload protection for single phase, polyphase and dc motors.

The self-indicating handle, interlocked cover that prevents opening unless starter is "off" and safety latch to lock starter "off," during servicing are personnel-protection features.

Positive motor-protection is provided by the quick-make, quick-break, overcenter toggle mechanism—De-ion arc-quenching—and bimetallic disk-type thermal overload relay.

Straight-through wiring facilitates installation and servicing, and Bonderized enclosures prevent blistering, flaking and corroding.

(The above item appeared on page 95 of the February 15th issue, with incorrect cut. It is here republished in full, with correct cut.—Ed.)

C-72—Puncture-Proof Butyl Tube

Announced by the Firestone Tire & Rubber Co., Akron, Ohio, is a lightweight puncture-proof butyl tube, which greatly increases safety in motoring and protects against roadside punctures.

The new tube, which seals itself instantly when punctured, is claimed the first of its kind to be made entirely of butyl, holding air many times longer than natural rubber tubes and outlasting several sets of tires. Its price is 25 per cent lower than the price of similar products now on the market.

The tube is made in three layers with two puncture sealing elements under the tread. The inner layer is a special soft butyl, which will flow around a nail or similar sharp object to prevent loss of air. An intermediate layer of especially compounded butyl resists tearing or enlargement of puncture holes. The tough, heat-resisting outer layer of butyl provides superior air retention.

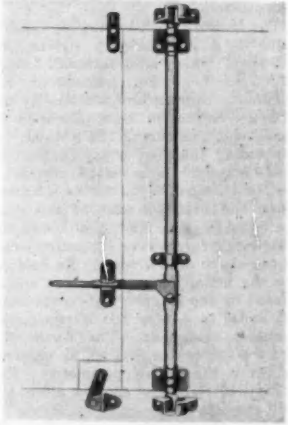
Because of its light weight, tires equipped with the new tube are said to be easy to balance; easy riding because of its greater flexibility; cooler running and safer at any speed.

C-73—Drop-Forged Door Fastener

New drop-forged tubular bar-type door fastener for trucks and trailer bodies are presented by W. H. Miner, Inc., Chicago, Ill. By the drop-forge process refinements in the component parts have been accomplished which permit use of special carbon steels of unusual hardness in texture, and vastly stronger and denser than the malleable iron product. The vertical locking bar of oval section design has the rigidity and torsional strength for withstanding rugged operating conditions at loading platforms.

Smoothness of all forged parts as well as the bar permits application of a superior finish with greater eye appeal to harmonize with the deluxe appearance of the trucks and trailers now offered by the builders. All parts of the truck door fasteners are given an aluminum finish prior to shipment.

A limiting stop feature prevents the handle from marring the finish on the truck body when opening the door. This is now contained in the rod guides, thereby reducing the number of parts. Further, by lengthening the upper and lower cams and increasing the depth of the keepers, greater contact areas have been provided to ensure positive engagement and security to lading.



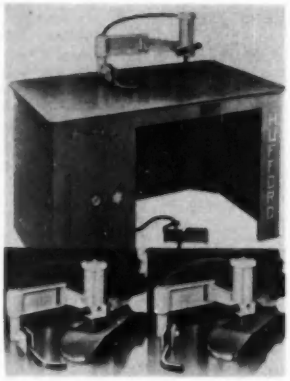
Miner (right hand) truck door fastener, No. 2300. (Model 2350 is for left hand doors.)

NEW PRODUCTS for AIRCRAFT

For additional information regarding any of these items, please use coupon on page 46

R-21—Two Aircraft Finishing Machines

Of interest to aircraft manufacturers are two new machines designed by Hufford Machine Works, Inc., Redondo Beach, Calif., for easing the manufacture of sheet metal parts.



Hufford shrink finishing machine

The Hufford shrink finishing machine removes wrinkles from those parts formed on rubber pad presses, which commonly occur when an edge is turned and the sheet metal placed in compression. Heretofore these wrinkles have been removed by a fatiguing manual operation.

The Hufford shrink finishing machine employs a mechanically driven lead "slapper" which eliminates all manual effort. A foot pedal releases air to a pneumatic clamp which secures the part and its respective form block to the steel table top during the process. By depressing the foot pedal further, the lead "slapper" is actuated parallel to the table, striking a series of blows along the wrinkled edge of the workpiece. After the first few blows, the slapper conforms over its entire length to the shape of the work. By restricting the metal flow to the area encompassed by the slapper and compressing the metal to occupy less surface area, wrinkles disappear. The form block and workpiece are rotated, as required, to cover the entire perimeter. Frequency of the blow can be altered to suit conditions.

After the shrinking operation, the work and form block are taken to the Hufford planishing machine. This incorporates an air-driven hammer assembly mounted on a smooth table top. The hammer is activated by pressure of the work against the head itself. A series of short, rapid blows quickly removes minor defects, producing a smooth, finished surface.

The planisher employs a removable work head, the shape of which can be chosen to suit the job.

To finish work of different heights, the entire planishing assembly is equipped with two elevating screws, one forward and one to the rear. Equal rotation of each screw quickly elevates or lowers the assembly. The head may likewise be tilted up or down to furnish a power stroke at right angles to a bevelled workpiece edge, by rotating the screws unequally or in opposite directions.

The development of these two machines not only speeds up many of the finishing operations, but permits use of female help on an otherwise strenuous job usually restricted to male labor. Both machines operate on the ordinary plant air supply.

R-22—Sub-Miniature Balanced Relay

A sub-miniature dynamically balanced relay for weight-critical electronic applications is being manufactured by Hufco Industries of Burbank, Calif., to meet specialized requirements for aircraft and missile installations in supersonic and hypersonic vehicles where precision parts and assemblies are needed in ever-decreasing weights, and greater component efficiency. Its weight is less than 1/3 oz, and it is therefore dubbed the "Wizard of Oz."

Design of the dynamically balanced armature provides the Hufco 1001 with high resistance to vibration and shock and sudden changes in acceleration and direction. It is a SPDT (single pole, double throw) 28-volt dc relay with contacts rated at one amp non-inductive load.

R-23—Explosion-Proof Magnetic Fuel Valve

Just announced by the aeronautical division of the Minneapolis-Honeywell Regulator Co., Phila., Pa., is a new explosion-proof magnetic fuel valve, designed to meet electrical, mechanical and operational requirements of military specifications, (MIL-V-5781 USAF 14 June 1950). The new valve provides instantaneous "on-off" flow control demanded of hydraulic lines conveying petroleum products or other non-corrosive liquids. Spring loaded valve action closes the valve immediately in the event of power failure.

Valve deterioration, due to "storage age," is eliminated by stamping a metal tag with the curing date of the oldest rubber component in each valve. This provides instant, on the spot information concerning the military life of the valve. Other features include straight threads instead of the customary pipe threads and an internally grounded two- pin connector providing positive assurance of an electrical circuit.

R-24—Jet Cockpit Air-Conditioning Unit

A new and larger version of its air-conditioning unit for jet fighter cockpits has been developed by Hamilton Standard division of United Aircraft Corp., East Hartford, Conn., the first of a substantial order for the unit having been shipped to Lockheed Aircraft Corp. for installation in its F-94C fighter for the Air Force.

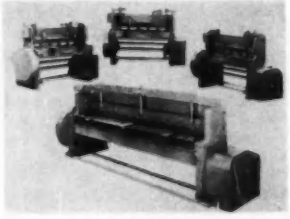
The unit bleeds hot air from the jet's engine and delivers either hot or cold air to the cockpit at a rate of 310 cu ft per min. Temperature of the air is automatically controlled by a thermostat in the cockpit set by the pilot. The air supply can range in temperature from 25 deg to 400 deg, depending upon cockpit requirements, and is changed completely four times per min.

NEW EQUIPMENT

(*Continued from page 49*)

than 30 per cent steel.

Standard equipment includes motor with controls and electrical equipment; ball-bearing, precision back-gage adjustable to 1/128th of an in., 2 front gage brackets and front gage; side and bevel gages; stainless steel scale embedded in the table to aid in positioning sheets; slatted metal finger guard; non-repeat unit; and 4-edge blades.



Three Wysong 52 in. 12 gage shears. The 10 ft shear, foreground, is standard model

The 52 in. shears illustrated have front operation for the precision back gage, and an automatic stroke counter. These special attachments were requested by one of the largest manufacturers of aircraft in the United States, the company reports. The 10 ft shear illustrated is a standard model.

Ausco's Diversified Facilities

(*Continued from page* 39)

has a floor space of some 135,200 sq ft and is currently melting some 210 tons of alloy per day.

Although the foundry is designed for the production of a variety of cast products, it is currently set up for making two crankshafts — one for a small four-cylinder engine, the other for a small six-cylinder engine. At the present writing, therefore, it represents an integrated single-purpose operation.

Cast crankshafts are produced in trees of four, using the dry sand core technique exclusively. Cores are prepared in steel molds, held to accurate size and form and designed to interlock positively to assure final accuracy of the product. The mold for six-cylinder crankshafts consists of an assembly of 22 cores, while the one for four-cylinders has 14 cores.

Melting is done by the cold-melt electric furnace process, using four Lectromelt top charging furnaces of 15-ton capacity. The alloy is of heat treatable type having the following chemical composition:

	C	Mn	Si	Cr	Cu	Ni	Mo	P	S
Min.	1.30	.70	.85	..	..	.45	.13	..	..
Max.	1.40	.90	1.05	.10	.10	.55	.18	.08	.08

Distinguishing feature of the operation is found in the facilities for sand handling since sand is one of the principal ingredients of the process. Being situated right at Lake Michigan, the foundry has available a plentiful supply of excellent lake sand from a nearby hill. Assurance of an ample supply of sand makes it unnecessary to reclaim, thus simplifying the sand handling installation. The sand handling system is Link-Belt throughout.

Lake sand is delivered directly to a grate covered chute outside the building and transported to the sand handling system overhead. Because of its source and exposure, sand varies in humidity from one to 10 per cent and is dried to standard conditions for molding in a Link-Belt horizontal type sand drier at a temperature of 800 F. From the drier it is carried directly to the mixers for preparation suitable for the molding floor. The foundry consumes roughly 300 tons of sand per day and has storage facilities for 600 tons.

Sand is delivered to the molding line on belt conveyors, molding being handled on a battery of automatic roll-over molding machines. As the cores are molded they are transferred to a conveyor line which transports them to Coleman vertical tower ovens for drying.

After drying the cores are removed from the oven and placed on a merry-go-round conveyor. They are removed for immersion in tanks containing a special core wash which provides an impenetrable surface coating. The cores then go back on the conveyor for a trip through a drying oven to bake the core wash. While still on the conveyor, cores are inspected and after drying are placed on trays in racks riding a heavy monorail which transports them to assembly and core storage.

Molds are assembled from the cores on small trucks riding the floor conveyor. As mentioned earlier, cores are made accurately to size and designed for interlocking when stacked for assembly. In addition, each core is numbered so as to facilitate assembly.

As the stacks are completed, they are tied together securely with tie-rods and gaged by the operators before the assembly is finalized. The molds now are ready for pouring.

Shifting the scene to the pouring lines, it will be recalled that melting is done in Lectromelt electric furnaces. As the furnaces are tapped, the metal is run off into eight-ton ladles for pouring.

Melting operations are carefully controlled by the metallurgical laboratory which has excellent facilities for wet chemistry, metallographic analysis, and physical testing. Samples of metal are drawn from each heat for chemical analysis and physical testing to assure conformity to specifications. In addition, a sample crankshaft from each heat is subjected to X-Ray analysis, using a new one-million-volt X-Ray machine at the St. Joseph plant.

Immediately following pouring, the molds travel through a cooling tunnel for an interval of about eight hours.

After cooling the molds reach the shake-out station where they are broken up, leaving the nest of four shafts. The heat number is then stamped on each casting for identification. Following this the shafts are removed from the sprue and transferred to a monorail for transport to the shot blasting operation.

Shot blasting of crankshafts is done in a large American Wheelabrator of four-wheel type, using steel shot for the purpose. Then the shafts proceed to the grinding room for removal of fins, burrs, gates, etc.

The work is now ready for heat treatment. This is done in a battery of two General Electric roller hearth furnaces, each one consisting of a normalizing furnace and a draw furnace, each unit being about 187 ft in length. Normalizing is done at a temperature of 1800 F and is followed by straightening in an H-P-M Fastraverse hydraulic press. Then the work returns to the conveyor for drawing at 1400 F.

Completion of heat treatment is followed by another trip through the shot blasting machine for removal of scale and final cleaning. The last stage in the process is final inspection. Here each shaft is given a roll test to check for runout, a drop test to assure freedom from cracks, and put through a spacing gage to check cheek spacing.

For a busy foundry the Riverside plant is clean and free from dust and fumes. Improved working conditions in the foundry are no accident, but result from planning and installation of suitable equipment. Perhaps the most important equipment contributing to good housekeeping is the system of wet dust collectors. These have been installed at the shake-out, at the grinders, and at the shot-blasting machine. In addition, a dust collector serves the sand mixing room, taking care of waste sand as well as shake-out sand, thus providing an additional safeguard for the shake-out operation.

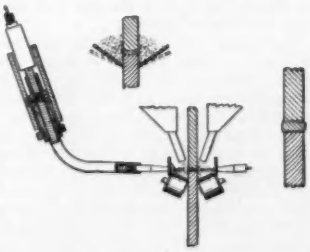
Hidden Arc Welding

(*Continued from page* 35)

tioned anywhere from flat to vertical, the joint being horizontal.

The new process, referred to as "3 o'clock" welding, expands the possibilities for the application of hidden arc techniques. Because joints can be positioned horizontally, welds from both sides of the joint can be made simultaneously. This reduces actual arc time on a given joint by about 50 per cent. Positioning each weld for downhand welding is eliminated thus reducing handling and set-up time.

In addition to reducing direct labor costs, savings are made because of the smaller sizes of electrode wire used. For example, where on a downhand application a 7/32 in. diameter electrode would be used, in a "3 o'clock" position a 3/32 in. or ⅛ in. diameter electrode is used. This means: lower currents are used; less electrode is required; smaller quantities of flux are consumed; welds of reduced cross sectional area are made, thus wasting less metal in unnecessary build-up. Welds can be made in either straight seams or following an irregular contour. Other advantages of the new process are a minimizing of the effects of distortion and the causes of weld cracking. Tendency for burn through is reduced and back-up strips can be eliminated where two arcs on opposite sides of the work are used.



Two New Inspection Devices

(*Continued from page* 45)

Setting and calibration of the machine are made by means of solid tungsten carbide reference setting rings mounted in a fixed position inside the machine. Gaging spindles are successively retracted through these reference GO and NOT GO rings in making the setup.

A further refinement in the setup and calibration is the adjustment to compensate for the difference in coefficients of expansion of the tungsten carbide reference masters and the blocks. This compensation is made manually, according to room temperature, by adjusting the air supply according to fixed calibrated setting dials.

Circuits of the various mechanical elements are so interlocked with each other and with protective devices that the machine is stopped automatically whenever interference is encountered at any point.

A distinctive feature of the control panel is found in the provision of automatic counters which provide a complete record of the number of bores of each size during the period of operation. This visual record gives an accurate statistical picture of how bore sizes are running at any time, and provides a measure of the range of piston sizes required for assembly during any period. Moreover, it provides quality control with information as to boring and honing machine condition and makes it possible to request specific changes in setup wherever there is indication of lack of control.

As may be expected, Ford carries on an extensive fundamental research program leading to further production applications of new and unique inspection devices. One of these is the Probograph instrument developed by the Industrial Scientific Co. of New York City. It is made in "Single-Probe" type for research work, the unit illustrated here being a universal instrument having compound slides. The versatility of this instrument makes it possible to set it up for the solution of a wide variety of problems, leading to the development of "Multi-Probe" instruments of automatic, single-purpose type for mass production inspection. As a matter of fact, Ford has on order "Multi-Probe" machines for the production inspection of camshafts, hypoid pinions, and several other large parts.

Currently the Probograph installed at Ford is being used to measure certain characteristics of hypoid pinions which have been exceedingly difficult to handle heretofore, and still more difficult to evaluate. With the development of current studies, it is expected that hypoid pinion manufacturing processes can be brought under closer control, thus leading to improvement in axle performance as well as a reduction in prime cost.

The Probograph measures and records all measurements instantaneously and with a magnification anywhere from 10 to 1 to 300 to 1, a ratio of 200 to 1 being customary for gears. The measurement of hypoid gears has always been a problem, but by means of the Probograph each tooth of the hypoid pinion is checked at ten precisely defined points and the recording is arranged in such a way that it takes less than a minute to see what is right and what is wrong with the pinion.

The Probograph operates on the principle that the probe is moved by a precision slide movement toward the part under measurement, and upon making contact with the part, a minute electric current passes through the probe. A stylus moves over Teledeltos paper simultaneously and in synchronism with the probe, but at a higher ratio. The electric impulse from the probe, upon making contact with the part, is transmitted through an electronic system to the stylus, and the graph is produced by marks which appear on the recording paper, fastened to a drum, showing the exact position at which contact was established between probe and part. The drum, in turn, is synchronized with the probing movement.

The measurement appears in the form of a small clear black mark on a dull white background. Each point appears on the record not only as a small distinct dot, but it is lined up in a straight line with the other dots representing corresponding points on the flanks of the teeth of the pinion. However, these dots only form a straight line if the gear is correct. If the gear should be faulty the dots deviate from a straight line in proportion to the error. This deviation is magnified on the record 200:1. An error of 0.0001 in. is clearly presented; not only individual errors but their general pattern being brought out. In this manner, eccentricity, spacing errors, errors in curvature, etc., show very clearly and in their correct relation. It takes less than a minute to obtain a complete picture while a tabulation of similar figures in the conventional manner may take hours to interpret.

Form New Advertising Agency—Marstellar, Gebhardt and Reed

Combining the 33-year old Chicago agency of Gebhardt & Brockson, Inc., and the Pittsburgh office of The McCarty Co., effective May 1, an advertising agency to be known as Marsteller, Gebhardt & Reed, Inc., will begin operations. The new company will be headed by E. A. Gebhardt, chairman of the board; Wm. A. Marsteller, president, and R. S. Reed, Jr., executive vice president and manager of the Pittsburgh office.

Other operations of the McCarty Co. will not be affected. T. T. McCarty, head of the McCarty Co., and long identified with the advertising of the Nordstrom Valve Div. of Rockwell Manufacturing Co., will continue to assist in the handling of the Nordstrom account. Likewise, the Marsteller Co., Chicago marketing consultant firm established Jan. 1 by Mr. Marsteller, will continue to be located in Chicago. Marsteller, Gebhardt & Reed, Inc., will maintain offices in Chicago and Pittsburgh.

Mr. Gebhardt, who has been president of Gebhardt & Brockson, is a veteran Chicago agency man. Until Jan. 1, when he opened the Marsteller Co., Mr. Marsteller was vice president in charge of advertising and market research of the Rockwell Manufacturing Co., Pittsburgh, and vice president and director of Edward Valves, Inc., East Chicago, Ind. Mr. Reed has been in charge of the McCarty Pittsburgh office since it was opened in 1944. Other officials of the new agency will include Lewis M. Williams, executive vice president in the Chicago office; Fred B. Livingston, vice president and art director; Harry Neal Baum, vice president; and Lucien M. Brouillette, John R. Burke, George A. Piper, John F. Conners, J. W. Evans, and Ambrose L. Duggan, account executives.

Included among accounts of Marsteller, Gebhardt & Reed, Inc., are the following:

Acro Manufacturing Co., Columbus, O. — Acro Switch Div. — Electric switches; Crise Controls Div.—Electric controls.

Aetna Ball & Roller Bearing Co., Chicago—Thrust and roller bearings.

Ahlberg Bearing Co., Chicago—Annular ball bearings.

Bryant Machinery & Engineering Co., Chicago—Machine tools.

Clark Equipment Co. — Automotive Div., Buchanan and Jackson, Mich.—Axles—front & rear, axle housinges and transmissions for trucks, buses, industrial & farm tractors; Industrial Truck Div., Battle Creek, Mich. — Fork-lift trucks—powered hand trucks & industrial towing tractors; Railway Div., Battle Creek, Mich.—Railway car trucks for suburban, elevated and street railway cars.

McDowell Manufacturing Co., Pittsburgh—Metal stampings, couplings, closures.

The Paltier Corp., Chicago — Materials handling systems.

Shafer Bearing Corp., Downers Grove, Ill.—Concave roller bearings.

SCHWITZER-CUMMINS COMPANY

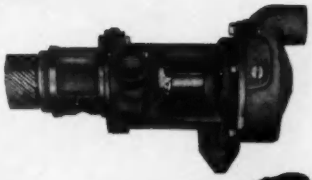
Specialists in

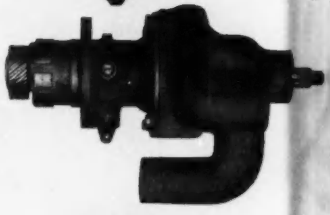
WATER and OIL PUMPS

A complete pump service for either your new production or for improving your present models. We offer an efficient pump—a fine impeller—or a superior automatic shaft seal.

We have been designing and building water and oil pumps since the pioneering days of the automotive industry. We started with it and have actively participated in every era of its development so we are now "headquarters" for pumps for automatic transmissions, and are building for some of today's famous ones. Our experience in efficient pump design, and where to apply fine workmanship, is invaluable in this fast developing engineering field, for which nothing less than the very best and most suitable in materials and the closest possible tolerances and fine finishes will do.

Our long experience is yours for the asking. Let us tackle your job. You want either advantage in performance or price. We have both. We will take your assignment as an obligation to obtain for you a highly efficient performance at minimum cost.





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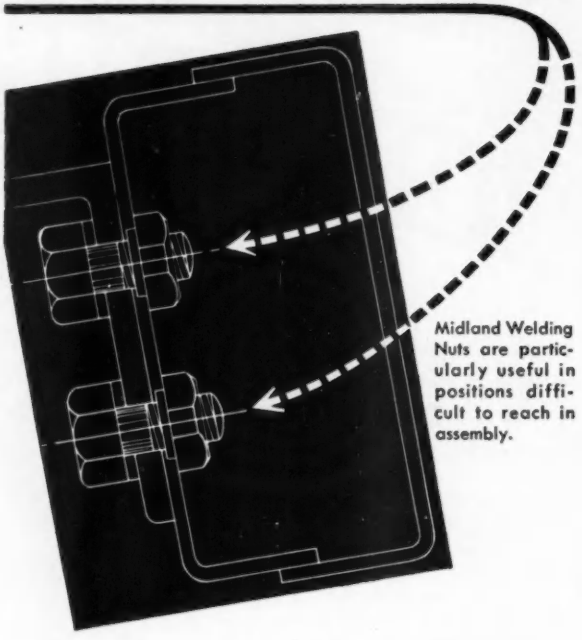

Midland Welding Nuts are particularly useful in positions difficult to reach in assembly.

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Business in Brief

Written by the Guaranty Trust Co., New York, Exclusively for AUTOMOTIVE INDUSTRIES.

General business activity early in February continued substantially higher than a year ago, although below levels established in recent weeks. Increases during this period were reported in construction and electric power output. For the week ended Feb. 3 the *New York Times* index of activity stands at 170.9, as compared with 180.2 in the preceding week and 150.4 a year ago. The decline in most components was attributed to the railroad strike.

The dollar value of department store sales in the week ended Feb. 3, as reported by the Federal Reserve Board, was equal to 233 per cent of the 1935-39 average, as compared with 279 in the week before. At this level, the value of sales was 3 per cent above that for the comparable week of last year. The total reported since the beginning of 1951 was about 26 per cent more than the corresponding sum in 1950.

Production of bituminous coal and lignite in the week ended Feb. 3 is estimated at 9,530,000 net tons, 1,880,000 less than in the week before but 2,990,000 more than the comparable amount a year earlier.

Civil engineering construction volume reported for the five-day week ended Feb. 8, according to *Engineering News-Record*, was $555.7 million, as compared with $235.1 million in the preceding week. The total recorded since the beginning of 1951, at $2057.7 million, is 69 per cent more than that in the corresponding period of 1950.

Production of electric power rose contra-seasonally during the week ended Feb. 3. At 7099 million kilowatt-hours, total output was 17.1 per cent above the amount a year earlier, as compared with a year-to-year advance of 16.7 per cent shown in the preceding week.

Railway freight loadings in the week ended Feb. 3 totaled 651,124 cars, 17 per cent less than the figure for the week before but 6.3 per cent more than the corresponding number last year.

The wholesale price index of the Bureau of Labor Statistics for the week ended Feb. 6, at the new record of 182.2 per cent of the 1926 average, was 5.5 per cent higher than the level of Dec. 5 and 16 per cent above the average for the May 24-June 24, 1950, period.

Daily crude oil output in the week ended Feb. 3 averaged 5,861,200 barrels, 127,200 less than in the preceding week but 4,945,100 more than production in the similar period of 1950.

Member-bank reserve balances increased $91 million during the week ended Feb. 7. Underlying changes thus reflected include increases of $209 million in Reserve-bank credit, $80 million in money in circulation, and $21 million in foreign deposits with the Federal Reserve banks. Decreases include $51 million in monetary gold stock, $12 million in Treasury deposits with Reserve banks and $27 million in other deposits with Federal Reserve banks.

Total loans and investments of reporting member banks decreased $804 million during the week ended Jan. 31. An advance of $102 million in commercial, industrial, and agricultural loans was recorded. Total business loans, at $18,120 million, were $4202 million more than the comparable sum a year earlier.

Designing Planetary Gears

(*Continued from page 29*)

dently of the face width; i.e., by selecting a range of tooth thicknesses and plotting the fatigue lives a point will be found at which the gear and pinion should both fail at once.

5. The final step is to solve Step 4 for the required face widths and determine the actual P-V values and tooth thicknesses.

The above is necessarily a short summary of a rather involved and detailed calculation. One point to remember is that planet pinions operate in reverse bending. Almen's fatigue life curve was determined from tests on countershaft transmissions in which the teeth are stressed from 0 to maximum in one direction only so that the planet pinion cycles required must be increased to compensate.

We feel that use of this method:

1. Results in the strongest and smallest gearset that meets requirements.

2. Offers a direct mathematical solution rather than cut and try to such questions as "what should the arcs of approach and recession be?" and "how long should these gears run?"

3. Prevents small pinion teeth from becoming too pointed.

4. Eliminates undercut (in most cases) from small pinion teeth.

5. Is most economical of materials because it strengthens the weak member (the pinion) of a pair of gears by using the excess strength of the gear which heretofore was wasted.

Two or three trials usually will be made before a final design is arrived at. The aim is to have every gear working to its limit, thus using all of the material to its utmost.

It may be of interest to know that no safety factor is used for the bending fatigue curve. This is practical for several reasons. First, there has been considerable improvement in manufacturing practices since the curves were published. Also, the adoption of crown shaving results in the reduction of stress concentration at the ends of the teeth. In addition, shock loading is reduced through the cushioning effect of the fluid driving member.

That this practice is justified can be seen from the fact that during the development of the Studebaker automatic transmission cars were run for 1500 miles at 30 mph, full throttle, in low gear with a towed load of 4600 lb with no evidence of gear tooth distress. In fact, because of this and other evidence, we are cautiously increasing the allowable stresses on future designs.

Some comments to be made on this method of calculation are:

1. Different pitches of the same physical size of grearset show no advantage in life expectancy one way or another. The lives of a coarse and fine pitch set having the same amount of steel in them calculate the same.

2. The long and short addendum and thick and thin tooth combinations allow the use of 20 deg full depth teeth without the danger of the teeth becoming pointed. This also allows adequate pitch contact ratio to be maintained.

3. Fine pitches show an advantage by permitting lower helix angles with a consequent reduction in the end thrust of the sun and ring gears.

4. We try to get as much pitch and face contact ratio as possible to soften tooth action (1.25 is absolute minimum for both).

5. For a transmission driven through a conventional clutch or fluid flywheel, peak engine torque at its proper speed is used in determining the stress values. For a transmission driven through a torque converter a slightly different approach is used. Using the tooth bending fatigue curve from Almen & Straub, and surface compression stress curves from the data by Buckingham, life equations are set up for bending fatigue and surface fatigue in terms of the converter torque and speed ratio characteristics. These are differentiated, set equal to zero and solved for the converter output torques and speeds where the gear life is a minimum. These

(*Turn to next page, please*)

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values are used in the grearset calculations.

The gears for the Studebaker automatic transmission were calculated according to the above method and, in addition, have some unique features that do not appear from a casual examination.

The front set has a 42-tooth sun gear, 13-tooth planets and a 69-tooth ring gear. But, $42 + 13 + 13 = 68$ which does not match with the 69-tooth ring gear. The gears are 16 normal pitch, 20 deg pressure angle and 20 deg helix angle. The planets and ring gear operate on so-called standard centers, while the planets and sun gear operate on spread centers. The planets and sun gear are cut on enlarged blanks and with long and short addendums. This is done to eliminate undercutting of the planet, provide adequate contact ratio, and reduce both bending and surface stresses. Furthermore, the planet tooth thicknesses are increased and the sun gear tooth thicknesses are decreased from standard to provide uniform bending fatigue life. The ring gear is cut deeper to accept the thicker planet teeth. The rear unit gears received similar treatment.

Obviously, these gears are far from standard. So, in order to determine the effect on noise, if any, of these non-standard gears, various other gearsets were built and tested. Some of these were "standard" gears, gears designed by the handbook, having standard addendums, tooth thicknesses and centers. Others were pinions having an extra tooth operating with production sun and ring gears, giving the effect of a reduced pressure angle. Enough sets of each were built to determine the overall trends. Neither of the two types proved to be appreciably different as regards noise than the production gears.

REFERENCES

[1] "Factors Influencing the Durability of Automobile Transmission Gears," J. O. Almen and J. C. Straub, AUTOMOTIVE INDUSTRIES, September 25, 1937, and October 9, 1937.

[2] "Manual of Gear Design," Earle Buckingham, *Machinery*.

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Aeroproducts Doubles Size of Plant

(*Continued from page* 40)

quired on aircraft propellers.

Requirements for the Aeroproducts plant expansion became necessary following Air Force negotiations for Aeroproducts propellers to be installed on the Fairchild C-119C aircraft, a super "flying boxcar" capable of hauling 10 tons of cargo. U. S. Navy requirements for production of turbine propellers for use on the Douglas A2D and Consolidated Vultee R3Y aircraft respectively also have been a factor in the expansion program.

Employment during peak propeller production is expected to reach about 4000 employees. At the present time approximately 1600 persons are employed.

Aeroproducts now has a C-119 airplane on bailment from the Air Force, which is being used for flight testing propellers of the type which will be installed. These propellers are 15 ft in diameter, are hydraulically operated, reversible, feathering, and incorporate electric de-icing.

Also nearing completion at Aeroproducts is a supersonic propeller "spin pit," developed under contract with the U. S. Navy, Bureau of Aeronautics, which is said to be the first of its kind in the world. In the very near future propellers will be whirled at supersonic speeds to accomplish various mechanical tests upon supersonic propellers, also being developed at Aeroproducts under contracts with the Air Force and the Navy.

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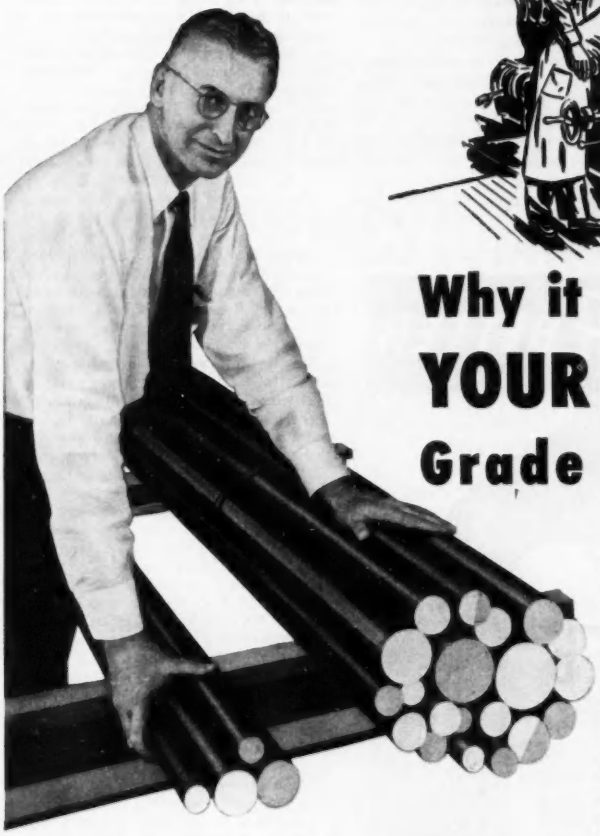

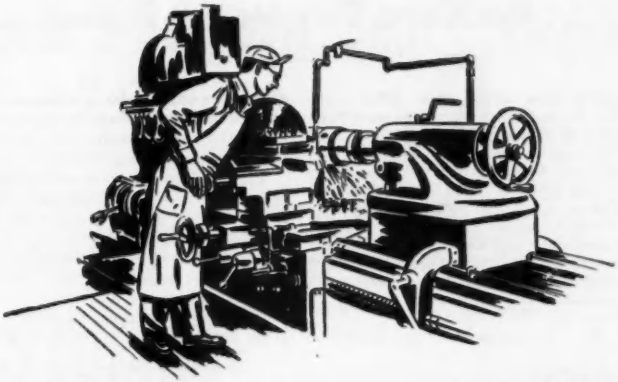

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This does not necessarily mean that we recommend the use of a few high-priced, general-purpose steels to fill all of your needs. We do suggest, however, that it will be to your advantage to make periodic studies of the steels you use to determine where you can eliminate superfluous grades so as to reduce your cost.

Our metallurgists will be glad to give you impartial advice on how to simplify or reduce the number of grades of alloy steel that you may now be using.

We manufacture and sell the entire range of AISI grades and special-analysis steels, as well as all of the standard carbon steels.

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BETHLEHEM ALLOY STEELS

BETHLEHEM STEEL

Machining Chrysler V-8 Engine

(*Continued from page 34*)

the 16 valve tappet holes. After reaming, the holes are burnished to a tolerance of plus or minus 0.00025 in.

It may be observed in following this sequence of operations that machining of the block is done in three distinct phases, the initial phase being outlined sketchily above. The second phase follows Lubriting, the first major operation being done in a 14-station transfer machine of special design having the sequence of operations shown in Table 2.

Next in line is the finish-broaching of bearing cap retaining channels in a small horizontal surface broaching machine. This sizes the channels previously prepared by rough-milling.

This is followed by a seven-station, two-way transfer machine for drilling holes in both ends of the block, and drilling oil gallery holes.

Tapping of 34 holes, including holes in angular locations in the cylinder head faces and top cover face, is done in a four-way tapping machine. Another four-way tapping machine of the same make handles the tapping of 51 holes in the pan face.

Washing and inspection prepare the block for the third phase of machining, this time as a cylinder block assembly. First step is the assembly of main bearing caps, tightening of cap screw being done in a special machine designed to take up the fastenings automatically with specified torque. Core-drilling and semi-finish-boring of cam and crank lines then are done in a six-station, two-way transfer type boring machine. Camshaft bearing holes are finish-bored in a horizontal boring machine which also semi-finish-bores the crank line, and oil pump and distributor bore.

The front end of the block is finish-milled in a traveling head mill. Oil seal grooves are finished in a special grooving and facing machine which also finish-faces the sides of several main bearings. Cylinder head faces then are finish-broached in a horizontal, tunnel-type hydraulic surface broaching machine.

This is followed by pressing-in of camshaft bearings in a 20-ton horizontal hydraulic press; and finish-boring of these bearings in a horizontal boring machine. The latter machine also finish-bores the crankshaft bearing line.

Unique on the Chrysler engine is the honing of main bearing bores in the special vertical machine illustrated here. Similar in many respects to a single-spindle hone, this machine has an extra long stroke—about 20 in.—which makes it possible to sweep the entire crank line with a single set of stones. The machine incorporates the automatic sizing feature mentioned in connection with cylinder honing equipment and is so arranged that all bores will come out to the same size. As may be noted in the illustration, the block is loaded in the fixture horizontaly, then the fixture tilts the block vertically under the honing tool.

Some impression of the performance of this machine may be gained from the fact that bore is held within 0.0003 in. on the diameter, and within 0.0001 in. for out-of-roundness.

Cylinder heads are given the Parco-line treatment, mentioned earlier, prior to machining. The first operation is the broaching of four faces in the enormous, two-way hydraulic horizontal surface broaching machine, illustrated here. Similar in basic design to machines described in AUTOMOTIVE INDUSTRIES recently, it is of three-station type and fully automatic in cycle. The first station broaches the top face and intake manifold side as well as the ledge for transfer. The center station is a roll-over fixture for presenting the lower face at the third station—the one at the left. The third station broaches the joint face and exhaust manifold face.

It is of interest that all of the tooling consists of individual tool bits and blades, the tool bits having cemented-carbide inserts, while the blades are of solid cemented-carbide. In all cases,

(*Turn to page 64, please*)

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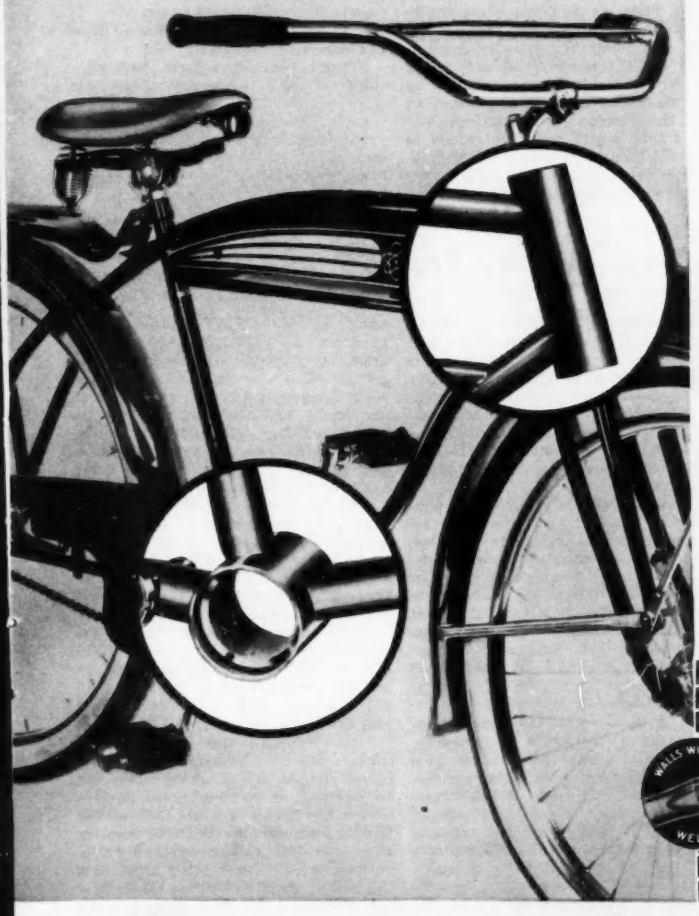

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Shelby Seamless Tubing has always been famous for uniform wall strength, from one end to the other. It's so strong that many manufacturers have long used it in place of solid bar stock; and, since *the basic shape is already made*, fewer operations are necessary, rejects go down, production costs can often be cut an appreciable extent.

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the tools are readily removed for grinding and preset so as to be replaced in the broach holder without further adjustment.

Individual blading of this character requires a great number of tools. For example, the first operation has a broach holder fitted with 372 individual tools and 18 solid carbide blades. The third station broach holder contains 405 individual tools and 18 solid carbide blades.

Besides producing a beautiful surface finish on all broached faces, this machine is also capable of holding extremely close tolerances. This may be appreciated from the fact that the height of the head—top to bottom face—is held in production to a tolerance of plus or minus 0.005 in.

Drilling, reaming, and chamfering of holes in top, bottom and intake manifold sides of the head then are done in a large 10-station transfer machine in sequence of operations shown in Table 3.

Next comes the finish-milling of spherical combustion chambers on a special two-spindle generating type mill, each tool having four cemented-carbide-tipped tools. This produces a true spherical contour and is arranged to hold a tolerance of plus or minus 0.002 in. on the radius and depth. By this means the maximum variation in combustion chamber volume is held to two-cc.

This is followed by another ten-station transfer type machine of the same make and general design. It is arranged to drill, ream, and chamfer exhaust valve guide and push rod holes, and exhaust manifold holes, as well as core drilling and counterboring of exhaust valve ports. It has 54 spindles.

The preceding machine handles the group of exhaust valve holes.

Operations on the intake valves—drilling, reaming, counterboring intake valve guide holes and spring seats, counterdrilling of two-, one-in. pipe holes, and tapping of all holes, are done in the succeeding nine-station transfer machine of the same make as the first two in the line. This machine is fitted with 66 spindles.

A group of two-station precision-boring machines is tooled for the following operations: Finish-bore exhaust valve guide holes, finish-counterbore for hardened exhaust valve inserts, finish-bore intake valve guide holes, chamfer 28-deg angle on intake valve throat.

At this point the cylinder head is ready for the assembly of pipe plugs and exhaust valve inserts, followed by final machining operations. It may be noted that inserts are fed automatically into a unit where they are chilled to around minus 140 F, contracting sufficiently at this temperature to facilitate installation in the bored holes.

The heads then enter a special machine designed to oil all intake and exhaust valve guide holes to facilitate pressing-in of valve guide bushings.

Final major operation on the heads is the finishing of intake and exhaust valve seats and valve guide bores in successive stages, a unique feature of the operation being found in the special design of equipment permitting both facing of exhaust valve seat and boring of stem hole in guide to be done simultaneously, thus assuring concentricity. This is done in a transfer machine consisting of four, four-spindle horizontal precision-boring machines arranged for a completely automatic cycle. It is probably the first installation of its kind in the industry. Reamers, boring tools, and facing tools for this machine all are tipped with cemented-carbide. Sequence in Table 4.

In concluding it may be worth noting that all of the new equipment installed here was built in accordance with JIC standards, emphasizing accessibility of wiring harness, motors, hydraulic lines, and accessory equipment.

Transfer machines have been provided with chip conveyors to facilitate chip removal. In addition, the larger transfer machines, particularly those producing a large volume of chips, have been fitted with roll-over fixtures between groups of operations for the purpose of ridding the work of chips.

Two New Military Trucks

(*Continued from page 37*)

vehicle of this size or nature. It is of two-speed type with forward ratios of 1 to 1 and 2.024 to 1, with constant mesh gearing and synchronized shift for both speeds. The major feature of this unit is the provision of an automatic means of engaging the front axle drive. Regardless of direction of the vehicle, this is accomplished through a double overrunning clutch on the front output shaft, which, in combination with a reduction gear set, is arranged to drive the front axle output shaft at a slower speed than that of the rear output shaft. This arrangement does not allow positive drive to the front wheels unless the rear wheels slip or until sufficient wind-up takes place in the rest of the running gear to absorb the difference in ratio of output shafts.

The transfer case also includes a power take-off which can be operated while either on the full run or at a standstill. A Timken Duo-Grip hand brake, capable of holding the vehicle on a 40 per cent grade in either direction, is also mounted on the transfer case.

In planning and designing the M-41 and M-51, the utmost stress was placed on a program of parts interchangeability and simplicity of maintenance. For example, the rear driving axles are interchangeable, the differentials in both front and rear axles are the same, one axle shaft design is used on the rear axles, and wheel hubs are the same all the way around. The dual wheel assembly on the M-51 is of such design that by reversing the hub and making simple changes in components, the assembly can be converted to use single wheels. By such a program of interchangeability, cost of spare parts is greatly reduced and the reduction of storage space is considerable, which is equally important.

A good example of maintenance simplicity is the fact that, for quick replacement in the field, the radiator, engine, and transmission are so designed and assembled that they can be removed from the vehicle as one integral unit, without removal of liquids and fuel. To facilitate this operation, all connecting bolts, fittings, mountings, and electrical connections, which must be disconnected for removal of the unit, are marked with yellow paint.

A look at the specifications and requirements of other units of these vehicles serve to point out their unusual features. The engine is a six cylinder, valve-in-head Continental R6602-69 special engine with a compression ratio of 6.4 to 1. It uses 80 octane gasoline, develops a maximum brake horsepower of 224 at 2800 rpm, and 504 lb-ft maximum torque at 1400 rpm. Other specifications are: 4⅞ in. bore, 5¾ in. stroke, and 602 cu in. piston displacement.

Major engine accessories include a military type oil filter, Donaldson oil bath (waterproof) air cleaner, Holley governor, and Holley Model R-415 downdraft waterproof carburetor and AC six-valve fuel pump. The engine is equipped with a 24-volt waterproofed and radio shielded electrical system which includes the following equipment: Delco-Remy 25 amp. generator, two 23-plate 100 amp-hr Delco-Remy batteries, and Delco-Remy starter.

Additional running gear units, other than the transfer case already described, consists of a 15 in. Rockford single plate clutch and a five-speed, direct in fifth, Spicer Model No. 6352 transmission with power take-off opening on the right side.

Front and rear axles are double reduction type Timken units with Model FM-240-A-1 used on the front unit on both the M-41 and M-51. Model M-240-A-1 is used on the M-41 rear tandem unit and M-240-B-2 on the M-51.

Semi-elliptic leaf type Standard Steel springs are used both front and rear. Direct double acting shock absorbers are mounted on the front only. Service brakes are "air-over-hydraulic" with a Bendix-Westinghouse 7½ cu ft capacity air compressor, employing 1990 cu in. air reservoirs. The booster brake is a 6½ cu in. Bendix Air-Pac. Hydraulic power steering provides passenger car steering ease. In the event of failure of the hydraulic unit, the truck can still be steered manually.

NEW PRODUCTS

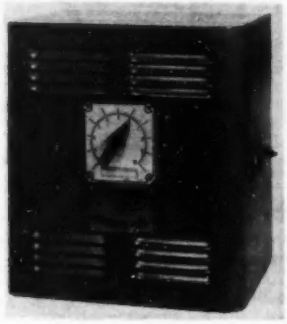
For additional information please use coupon on page 46

(*Continued from page* 53)

C-74—Spot Welding Control

New synchronous and non-synchronous control equipment for low-capacity, spot-type resistance welding machines is available from Westinghouse Electric Corp., Pittsburgh, Pa.

Air-cooled thyratron tubes make and break the welding current, with no moving parts. All components in each equipment are mounted on a side-swinging panel, enclosed in a NEMA type I enclosure for ease of inspection and maintenance. The units can be mounted on or near the welding machine. Knockouts are provided in the enclosure to facilitate making external electrical connections.



Westinghouse spot welding control

Synchronous units can be supplied in rms current ratings up to 50 amps at a 10 per cent duty cycle. Non-synchronous units are available in ratings up to 100 amps at 10 per cent duty cycle.

HOTCHKISS

(*Continued from page* 41)

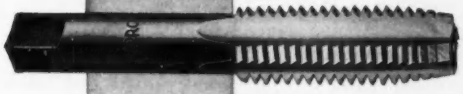
rate rims are bolted. Rear suspension is independent by means of light-alloy oscillating arms, with a stub axle for each wheel and suspension by variable-rate, horizontally-mounted coil springs. An anti-roll bar and hydraulic shock absorbers supplement main suspension.

The bodies at present being produced have a wood frame with all-aluminum paneling; however, an aluminum frame is being developed. First deliveries of the Hotchkiss-Gregoire are for June.

HY-PRO

"Sustained TAP Accuracy" assures STRONGER FASTENINGS

HY-PRO Taps stay accurate longer to produce threads with uniformly close tolerances. This SUSTAINED ACCURACY effects stronger, tighter, more enduring fastenings that resist the loosening action of vibration. When tapped with SUSTAINED ACCURACY, your threaded parts will give longer, trouble-free service.



HY-PRO Taps provide definite production economies because they stay on the job longer . . . require less sharpening . . . produce more accurately threaded holes per tap. Competitive tests on the job prove this economy aids in offsetting high labor costs through greater production.

Specify HY-PRO Taps for High Production at Less Cost! Their stamina and precision assure every tap user of definite economies, plus sustained accurate threading on the toughest or the most meticulous assignment. Effect these savings and efficiencies in your tapping operations NOW!

If you are troubled by "Threadaches", consult our Engineering Department. A thorough diagnosis will be made and a treatment prescribed by specialists with an enviable record of cures. Just send the symptoms in detail. Prompt recommendation for treatment will be forwarded.

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High Speed Steel Ground Thread Taps

Call your nearest HY-PRO Distributor, and order your requirements from the full line of standard H.S. Steel Ground Thread Taps stocked for your convenience. Specials made on order to your specifications.

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Turn Signal Switches

Rolled Shapes

Widely used by leading builders of cars, trucks, buses and tractors, Mitchell ignition switches, turn signal switches and rolled shapes meet the most exacting specifications of the automotive industry.

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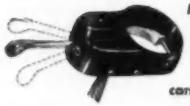
Original equipment on many popular make vehicles, Mitchell ignition switches are noted for extra long life. "Radio" position at no extra cost.

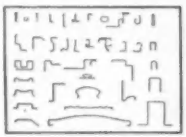
TURN SIGNAL SWITCHES

Semi- automatic, self-cancelling. Afford drivers easy, positive way to indicate turns to approaching and following traffic as well as to pedestrians.



Mitchell clamp-on and screw-type semi-automatic turn signal switch for trucks, cars, buses, tractors.

Mitchell 6-wire concentric-type semi-automatic turn signal switch used in passenger cars.



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Complete range of metals, designs and gauges in stainless steel, aluminum, brass, bronze, copper—cold rolled, drawn and pressed—for automobiles, airplanes, railroad cars, architectural requirements, radios, television receivers, all industrial uses.

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CALENDAR

OF COMING SHOWS AND MEETINGS

Conventions and Meetings

SAE Passenger Car Body & Materials Mtg., Detroit .....Mar. 6-8

International Auto Salon, Geneva, Switzerland .....Mar. 8-18

Amer. Soc. Tool Engrs., New York City .....Mar. 17

Western Metal Exposition and Congress, Oakland, Calif. .....Mar. 19-23

Pacific Automotive Show, Seattle Mar. 21-24

Salone Internazionale Dell Automobile, Turin, Italy .....Apr. 4-15

British Automobile and Motor Cycle Show, New York City .....Apr. 15-23

Amer. Soc. Lubricating Engrs., Phila. .....Apr. 16-18

SAE National Aeronautic and Aircraft Engine Display, Hotel Statler, N.Y.C. .....Apr. 16-18

Amer. Mgt. Assoc., Nat'l Packaging Expos., Atlantic City .....Apr. 17-20

1951 Metal Powder Show and 7th Annual Meeting of Metal Powder Assn., Cleveland, Ohio .....Apr. 25-26

Chamber of Commerce Annual Mtg. Washington, D. C. .....Apr. 30-May 2

Materials Handling Conference, Chicago .....Apr. 30-May 4

A.E.R.A. Convention, Chicago ....May 7-9

Nat'l Air Races, Cleveland Airport May 19-20

Amer. Society for Quality Control, Cleveland .....May 23-24

SAE National Summer Meeting, French Lick, Ind. .....June 3-8

Third World Petroleum Congress, The Hague, Scheveningen, Holland .....May 28-June 6

American Gear Manufacturers Assn. (Annual Meeting), Hot Springs, Va. .....June 4-6

American Society of Mechanical Engineers semi-annual meeting, Toronto, Canada .....June 11-15

American Society for Testing Mat'ls Annual Meeting, Atlantic City, N. J. .....June 18-22

SAE National West Coast Meeting, Seattle, Wash. .....Aug. 13-15

First European Machine Tool Exhibition, Paris .....Sept. 1-10

SAE Tractor and Production Forum, Milwaukee, Wis. .....Sept. 10-13

Sixth National Instrument Conference and Exhibit, Houston, Texas Sept. 10-14

American Society of Mechanical Engineers (fall meeting) Minneapolis, Minn. .....Sept. 25-28

Nat'l Metal Trades Assn., Chicago, Ill. .....Sept. 26-28

SAE National Aeronautic, Production Forum, And Display, Biltmore Hotel, Los Angeles, Calif. ....Oct. 3-6

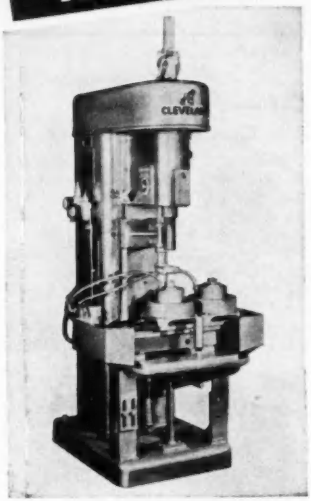
SAE National Transportation Meeting, Knickerbocker Hotel, Chicago, Ill. .....Oct. 29-31

SAE National Diesel Engine Meeting, Drake Hotel, Chicago, Ill. ...Oct. 29-30

SAE National Fuels and Lubricants Meeting, Drake Hotel, Chicago Ill. .....Oct. 31-Nov. 1

Cut Tapping Costs with

CLEVELAND TAPPERS



This Cleveland Tapping Machine is set up on a munitions job, tapping a $1\frac{15}{32}$", 16-pitch Buttress thread in SAE 4340 steel tubing hardened to 35 to 37 Rockwell.

On Tapping, Threading, Drilling, Spotfacing, Reaming, and Chamfering operations, the chances are that CLEVELAND engineers can save you money and valuable working time by designing a CLEVELAND Tapping Machine which will not only combine several operations but also tap groups of holes at one stroke of the machine. *Check with CLEVELAND first.*

Only CLEVELAND offers you all these features.

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- *Fully automatic or manual control.*
- *Precision depth control for blind hole tapping.*
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- *Exclusive super sensitive clutch reduces breakage and increases tap life.*
- *Positive coolant and lubricant supply under constant control of operator.*
- *Rigidly constructed to give years of service.*
- *Maximum safety for operator and machine.*

If you would like recommendations on a machine, submit prints, specifications, and sample parts. Write for your copy of the CLEVELAND Production Tapping Guide No. AT-1.

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Mr. Gifford has believed in—and worked for—payroll savings plans for thirty-seven years—since 1913, when, as Statistician of the A. T. & T., Mr. Gifford developed a payroll savings plan for the purchase of A. T. & T. stock.

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In upwards of 21,000 large companies, more than 8 million Americans are investing $150,000,000 in U. S. Savings Bonds ***every month.*** To the systematic saving of these men and women—and the whole-hearted co-operation of executives like Mr. Gifford—is due in no small measure the important feeling of ownership shared by the Americans who own 56 billion dollars in U. S. Savings Bonds (against 45 billions at the end of the war!).

Every Payroll Savings Plan is a reflection of the vision and enthusiasm of the top executive of the company. If he gets behind it, ***personally,*** employee participation is high—to the benefit of the country, the company and the employee. If the interest of the Big Boss is active—participation may very well exceed the 50% mark. The top man is the key man in a Payroll Savings Plan.

Get in touch with your State Director, Savings Bond Division, U. S. Treasury Department. He will help you put in a plan . . . or he will show you how to increase employee participation—without undue effort or high pressure tactics.

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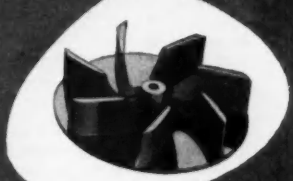

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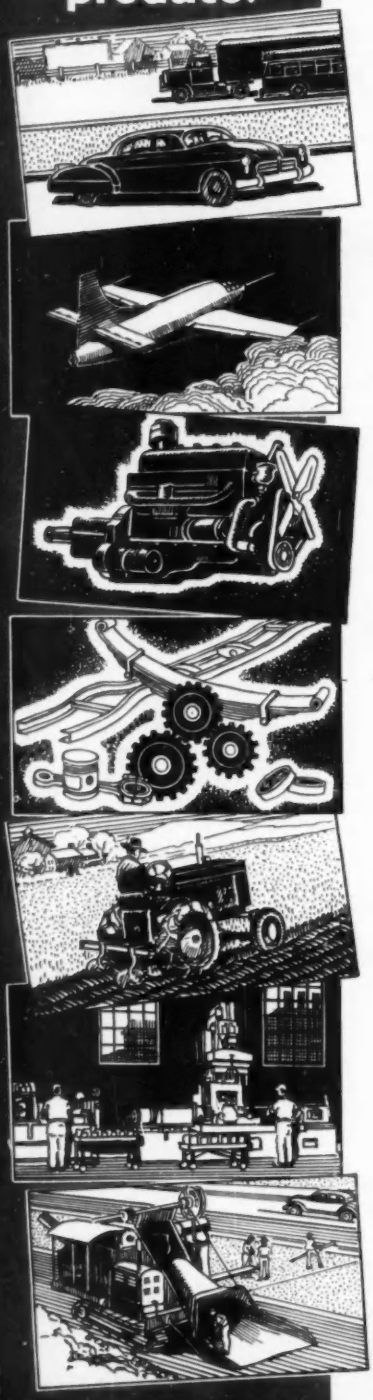

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Answer: ***The design, production, engineering, administrative, purchasing and sales executives throughout the four corners of the automotive plants.***

PURCHASING . . . A MULTIPLE PROCESS

The $8 billion purchase order issued by the automotive industries to American industry during 1949 was the result of the coordinated functions of automotive men at the executive level in design, production, engineering research, purchasing and administration. These specifying executives, working as a team, are deep in the automotive plants and often cannot be reached by industrial salesmen . . . yet have the power to say "yes" (or "no") to products under consideration.

HOW TO REACH THESE BUYING TEAMS

AUTOMOTIVE INDUSTRIES' circulation (12,157 net paid) is directed to design, production and administrative executives in 3118 automotive plants. The Advertising Research Foundation's Business Paper Study #1 of AUTOMOTIVE INDUSTRIES proved that 75% of subscribers and pass-along readers directly enter into or influence the purchase of parts, materials and production equipment for their plants . . . 81% of these specify make or brand of product.

DEEP PENETRATION OF YOUR SALES MESSAGE

Only AUTOMOTIVE INDUSTRIES provides *full* penetration of the buying influences in the Nation's automotive plants, presenting its 23,000 proved readers twice each month with complete coverage of late developments in automotive manufacturing. No other magazine performs this vital function. AUTOMOTIVE INDUSTRIES, since 1895, is an integral part of the great industries it covers.

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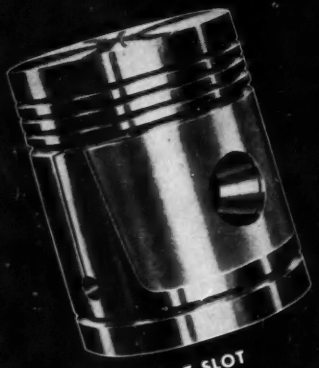

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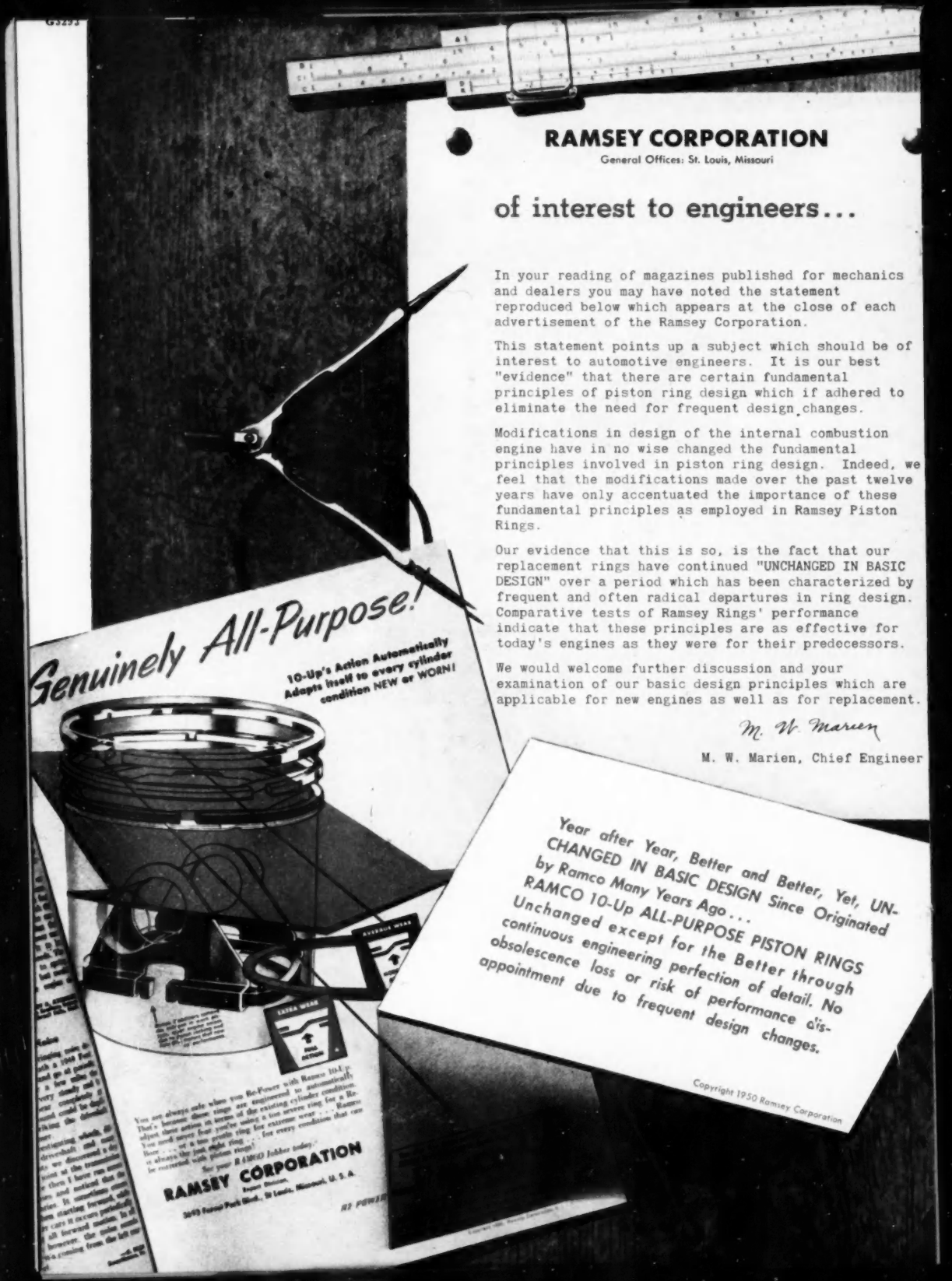
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of interest to engineers...
In your reading of magazines published for mechanics and dealers you may have noted the statement reproduced below which appears at the close of each advertisement of the Ramsey Corporation.
This statement points up a subject which should be of interest to automotive engineers. It is our best "evidence" that there are certain fundamental principles of piston ring design which if adhered to eliminate the need for frequent design changes.
Modifications in design of the internal combustion engine have in no wise changed the fundamental principles involved in piston ring design. Indeed, we feel that the modifications made over the past twelve years have only accentuated the importance of these fundamental principles as employed in Ramsey Piston Rings.
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